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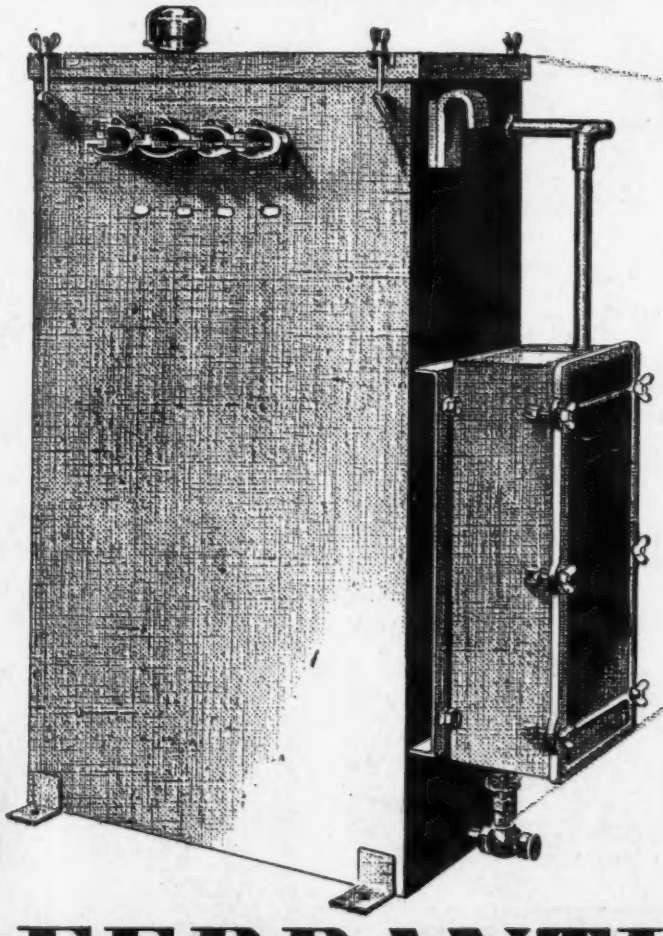

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The
Electrical Review

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Railway Electrification Experience

THE electrification of the Manchester, South Junction and Altrincham railway is of much more importance than its route length of 8¼ miles might appear to signify. To begin with, the construction of the overhead equipment had to provide for almost every difficulty likely to be found in an extensive scheme. Yet the capital expenditure is somewhat lower than the estimates, indicating how closely the cost of such electrification can be forecast.

The Altrincham railway is the first passenger line in this country to adopt the 1,500-V overhead d.c. system standardised by the Pringle Committee in 1927, which will make it easy to merge into a general scheme of main-line electrification later. It is also the first in Great Britain to employ a 1,500-V rectifier for traction work.

The chief value of Lt.-Col. F. A. Cortez-Leigh's I.E.E. paper is in the results he gives of the first year of operation. Two points stand out: the first is that, in competition with a recently inaugurated express bus service, an increase of 35 per cent. in passenger traffic has been obtained, due to increased comfort of travelling and the greatly accelerated service made possible through the reserve available with the straight electric drive; the other is the pronounced success of the rectifier, which gives ground to the belief that it will in future hold the field for, at any rate, 1,500-V systems. The claims of the rotary convertor for power factor correction were advanced during the subsequent discussion, but we do not see why the railways should be called upon to compensate for a fault of the industrial load.

Striking support for the advocates of straight electric, as compared with Diesel-electric, working was given by Mr. H. W. H. Richards, who placed the horse power required by the two systems in the ratio of six to ten, about half the oil-engine power being required to haul the motive equipment. If a Diesel system was adopted for main-line operation the weight could be reduced by dispensing with the electrical component, which the improving flexibility of the oil engine would make less necessary for through running or for smaller sizes, as was pointed out in a recent discussion at the Institute of Fuel.

We can strongly support Professor Cramp's plea for international co-ordination of data regarding the wear of the overhead conductors, which at present have a life of only from four to five years; any improvement here would result in large economies in maintenance. A noteworthy feature of the overhead equipment is the use, probably for the first time on traction work in this country, of porcelain insulators in tension; we suggest that the possibilities of Pyrex glass should not be overlooked where fumes from steam locomotives cause trouble.

The technical experience gained from this electrification has been very useful, but probably even more to the point is the complete satisfaction with the results expressed by Sir Josiah Stamp, president of the L.M.S. Railway.

B & K Enterprise

"OUR electricity last year cost us nearly 10 per cent. less per unit than the year before, and we were able to sell 16 per cent. more units at a reduction of nearly 10 per cent. on our average price." This was one of the very satisfactory statements made by Mr. H. R. Beeton in his speech as chairman of the Brompton and Kensington Electricity Supply Company. The result indicated was attributed mainly to the consolidation of generation by nine London companies. This "little company" is therefore able to claim a larger proportional increase in output, after excluding supplies in bulk, than any other company in London, a position largely due to the enterprise with which it has tackled the development of the domestic demand. The speech was full of points of interest containing figures showing the advantage obtained by demand. Congratulations to Mr. R. S. Downe, the general manager and engineer, and, incidentally, the new vice-chairman of E.D.A., who has for many years pursued a progressive domestic policy! The speech showed the advantage obtained by consumers under the two-part tariff. As an example of the potentiality

in demand from changing conditions in the B. & K. area the speaker mentioned the case of a boarding house which, as such, consumed only 5,000 units, but which now, after conversion into flats, consumes over 100,000 units. Full recognition is given to intensive local salesmanship with showrooms and a generous continuous expenditure upon the advertisement of domestic electricity. Mr. Beeton looks to the setting up of a national publicity system for spreading the electrical gospel everywhere. Legislative disabilities clipped the wings of the industry at the outset, but they are growing again, giving rise to hopes that we shall more speedily ensure that the manifold benefits of electricity can be had " wherever they are wanted, whenever they are wanted."

Radio Exchanges

THE report that Middlesbrough Corporation is seeking powers to operate a radio relay system is a new phase in a development which has now gone a long way. This is the first case of a municipality contemplating such a course, although there are already about 200 " radio exchanges " now in operation. The case for these exchanges is that there are many members of the public who are unable to buy a receiving set but can pay a small weekly fee for such a service. At the same time the effect upon the sale of receiving sets, and consequently upon their prices may be to put them beyond the reach of many who could just afford them. The fact remains, however, that the system is now firmly established, and that it must be considered how the interests of electricity supply can best be served. The Middlesbrough Corporation proposes to use its existing supply mains for the purpose of relaying the B.B.C. programmes, so that it is conceivable that the system will lead to a demand for new connections. This would naturally tend to further electrical applications, so that in the end the industry might easily derive sufficient business to compensate for the loss in another direction.

Taking an Opportunity

SOME of the £18,000,000 spent on frequency standardisation will no doubt be returned to the industry in economies due to facilitated interconnection of power stations. More will come out of the lower cost of building motors for one frequency instead of eleven frequencies as at present. There is a possible third saving of which the most should be made. Many industrial concerns are taking advantage of the changing of their motors to rearrange their plant on the most modern lines, but the initiative should not be left to the works owners. The possibilities of the situation are shown by some figures given by Mr. D. Maxwell Buist, district manager for the C.E.B. on the North-East Coast, where half the national cost of standardisation is being spent in the provision of work for 3,000 men. The 35,000 motors (aggregating 850,000 h.p.) being changed over for some 2,500 power consumers include the drives for seventy winders (100 to 1,000 h.p.), twenty rolling mills (400 to 4,000 h.p.), and machinery in 200 collieries and 250 factories and shipyards. Owing to trade depression the work can be carried out more speedily than would otherwise be possible, and consequently at a lower cost.

American Conventions

THE editor of the leading American electrical journal appeals in the issue just to hand for an All-Electrical Convention to be held at Chicago. American industry is urged to reorganise, consolidate, and co-operate. The problems and opportunities have outgrown sectional interests, and collective action is recommended as the road to prosperity. The writer advocates the setting up of a joint committee of the several trade associations to formulate the programme for a convention " early in the summer," and asks who will take the lead in calling " this most vital " meeting. It is further stated that more than 1,500 delegates, including a large number of electrical equipment manufacturers, will attend the National Foreign Trade Convention in Pittsburgh, from April 26 to 28. This is an annual event devoted exclusively to foreign trade matters.

Our Moscow Confrères

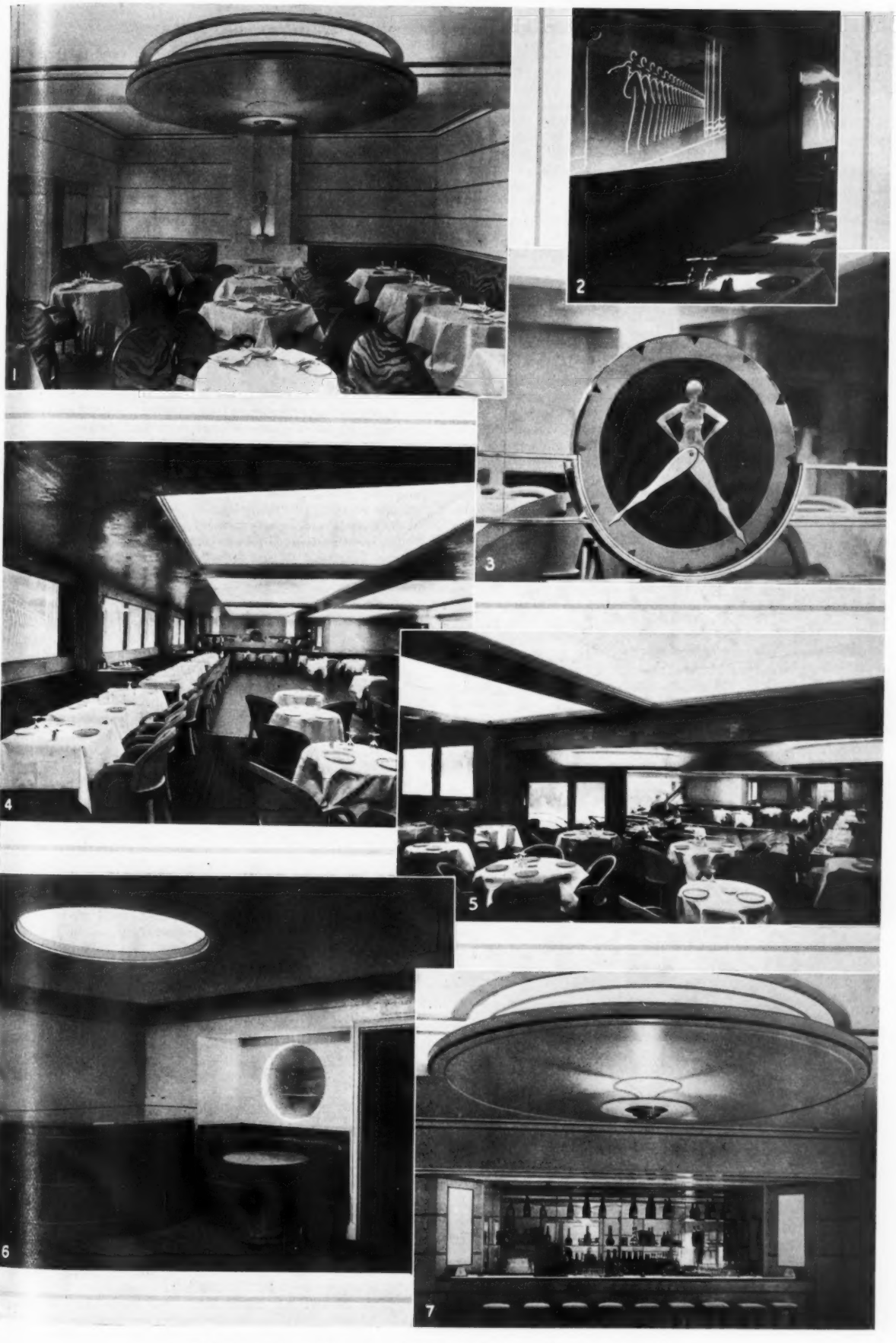
SIR FELIX POLE addressed the annual meeting of Associated Electrical Industries under the shadow of what was happening in Moscow. He stated that bearing in mind that the Metropolitan-Vickers Company had had satisfactory business relations with the representatives of the Russian Government extending over the last ten years, recent events were quite inexplicable and difficult to talk about. At the time of writing, the trial of the British engineers is proceeding, and their electrical and engineering colleagues in this and other industrial countries will generally concur in Sir Felix Pole's hope that they will soon receive full and honourable acquittal. The financial position of the matter, stated briefly, is that all moneys due to the company down to and including last week, have been paid, and the balance becomes due at various dates over the next five years. The amount involved is about £1,500,000.

The Affairs of the Group

IN his review of the affairs of the Associated companies, Sir Felix Pole said that the group was in an exceptionally strong position financially to take advantage of any trade revival. He reported marked development and progress in all departments, also active operations, with good results, in the research department at Trafford Park. They had a lighter order book and had effected economies with due regard to the maintenance of efficiency, and the number of employés was considerably less than a year or two ago. Considering, however, the adverse trade conditions throughout the world and the fall in exports, their own results were quite satisfactory. At home orders for the lighter types of apparatus were keeping up fairly well, and as the consumption of electricity was always increasing they should continue to do so. The outlook will be improved by the expenditure of reproductive capital by the Government and local authorities; no moment for such outlay could be more favourable than the present. Railway electrification possibilities under the new Transport Bill also raise hopes on the part of the company which, of course, has specialised in such work. The suggestion recently advanced by Mr. W. C. Lusk (now managing director of Associated Electrical Industries), as chairman of the B.T.-H. Co., that the leading manufacturing companies should try to find a suitable way of dealing with the question of excess electrical manufacturing facilities was earnestly commended by the speaker. It was not to the ultimate advantage of either their customers or the nation that the productive capacity in many important branches of the industry was greatly in excess of requirements.

The Tenant Will Decide

IF the wish of the Gas Light and Coke Company be sincere that tenants of municipal houses should have complete freedom of choice as to the form of energy used for cooking, heating, and lighting, then every house should be wired for electricity and piped for gas throughout. One installation would be partly or entirely idle in each house intended to be erected at a low capital cost. As counsel for several opposing municipalities submitted before a Committee of the House of Commons this would be impracticable. Progressive municipalities are naturally disposed to give tenants of new houses opportunities to employ the best and most up-to-date methods for all domestic purposes. Our electrical industry has no need to promote legislation to protect it against competition. We are satisfied that without such aid the better alternative will win in our sure knowledge of which is the better alternative.



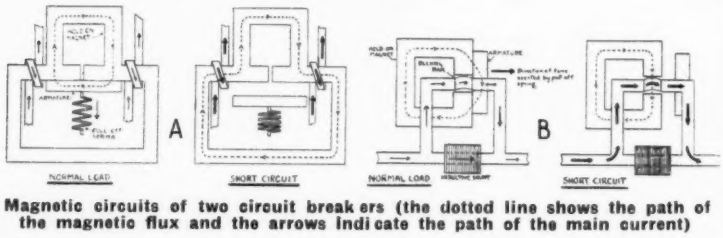
Lighting Novelties at Casani's Club. **(See page 534)**

1. The lounge. 2. Illuminated panels and table lighting. 3. A novel electric clock. 4 and 5. The main restaurant and dance floor. 6. The small cocktail bar. 7. Elaborate lighting arrangements in the large cocktail bar.

High-speed Circuit Breakers. By H. C. Harris, A.M.I.E.E.

Their application to remote-controlled traction sub-stations

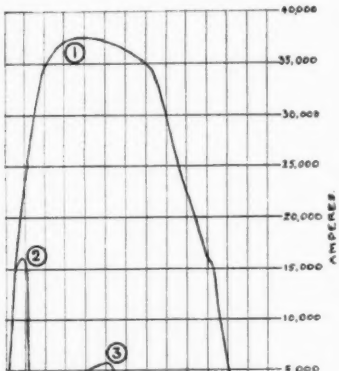
HIGH-SPEED circuit breakers are essential for clearing circuits where heavy overloads are liable to occur and short-circuits are liable to reach considerable proportions. This type of breaker has its moving contacts attached to an armature, which is magnetically held in the closed position. When a fault occurs, the magnetic flux in the hold-on magnet and armature is deflected, which allows the latter to be pulled to the open position by powerful springs.



Magnetic circuits of two circuit breakers (the dotted line shows the path of the magnetic flux and the arrows indicate the path of the main current)

As there is no latching device, there is no delay in opening due to the time taken in lifting the latch, as in older types of breaker. The time taken for a modern high-speed circuit breaker to clear a dead short is about 0.01 sec., compared with over 0.12 sec. for an old type of latching breaker.

The magnetic circuits of two well-known types of high-speed circuit breaker are illustrated. In the first case two single-turn coils carry the main current, which, on reaching a certain prearranged amount, deflects the flux as shown. In the second case the main current has a choice of two paths, either through a single turn known as a "bucking bar," between the poles of the hold-on magnet, or through an inductive shunt composed of a straight strip of copper on which is threaded a number of iron laminations. When the rise of current is relatively slow, the flow of current is divided between the bucking bar and the inductive shunt, but when the rise is fast the greater portion of the current will flow through the bucking bar due to the impedance of the shunt. In this way the breaker is made to open more quickly on a dead short than on an overload or distant short.



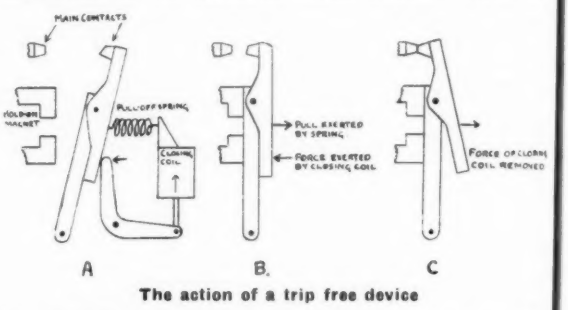
Short-circuit tests with a 1,200-kW, 500-V rotary convertor. 1. A standard circuit breaker on a dead short. 2. A high speed c.b. on a dead short. 3. A high speed c.b. on a short two miles away (conductor rail)

All high-speed circuit breakers are equipped with powerful magnetic blow-outs, arcing horns, and long narrow chutes which quickly cool the arc. A trip-free device is used on some makes, in which the main contacts do not come together until the closing lever has been withdrawn. In another make the closing mechanism pushes the armature up to about ¼ in. from the hold-on magnet, in which position the auxiliary contacts are made. If there is no fault the hold-on magnet pulls the armature the rest of the way, but if there is a short or overload the flux will be deflected, and it will be impossible to close further than the auxiliary contacts. A pair of interlocking contacts in series with the closing contactor which are opened by the closing of the breaker prevents the latter from being held with its auxiliary contacts closed, and a time-delay relay ensures that a reasonable time elapses before reclosing.

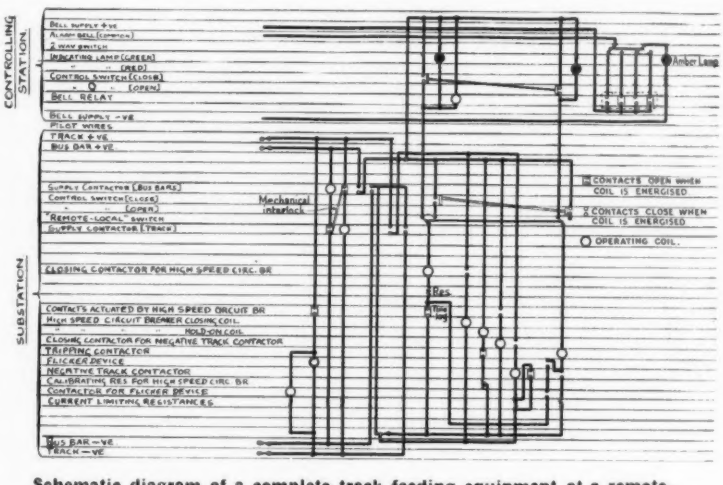
Calibration is carried out by varying the current in the hold-on coil, the reluctance of the magnet, and the tension of the pull-off springs; in those makes fitted with an inductive shunt the number of laminations round the latter can be varied to suit the inductance of the external circuit.

The accompanying schematic diagram relates to a complete track feeder equipment at a remote-controlled traction sub-station. Two interlocked contactors enable the operating supply to be taken either from the tracks, or from the busbars. The operation of a switch at the controlling station closes a contactor for the high-speed breaker, completing the circuit through the closing coil of the latter, which is held in position by the hold-on magnet. This magnet remains excited all the time, except at the moment of tripping. A pair of contacts actuated by the high-speed circuit breaker completes the circuit for the closing contactor of the negative feeder, which is held closed until the high-speed circuit breaker is opened. Two contacts on the negative feeder contactor complete the red-lamp circuit, and the opening of the time lag contacts on the high-speed circuit breaker breaks the green-lamp circuit, thus indicating that the tracks are on the busbars.

To disconnect the tracks from the bars, the "open" switch in the controlling station is operated, which breaks the hold-on coil circuit of the high-speed circuit breaker. When the latter opens it actuates a relay, which causes an alarm bell to ring and lights an amber lamp at the controlling station. This alarm bell can be switched off by a two-way switch, which changes the circuit so that the alarm bell rings when the tracks are closed again, ensuring that the operator remembers to put this switch back to the correct position. (*i.e.*, to ring when the circuit breaker opens). The tracks may remain alive after being disconnected, due to their being fed from more than one point, or to a train bridging the insulating gap at one end of the section. When this happens current flows from the track through a pair of contacts on the high-speed breaker to work a flicker device.



The action of a trip free device



Schematic diagram of a complete track feeding equipment at a remote-controlled sub-station

The sub-station can be operated locally by changing the position of the "remote-local" switch. It is usual to provide high-speed circuit breakers on each individual feeder circuit, and one in the positive lead of each machine having the direction of the current in its hold-on coils reversed, so that it opens on the reverse current only.

Acknowledgments are due to the General Electric Co., Ltd. and the Metropolitan Vickers Electrical Co., Ltd., for supplying information on this subject.

Electricity in Mauritius. By T. Williams, A.M.I.E.E.

MAURITIUS is a sub-tropical island situated east of Madagascar in the Southern Indian Ocean. It has a population of nearly half a million, mostly Indians, an area of 705 sq. miles, and a maximum length and breadth of 39 and 28 miles respectively. Numerous rivers fall rapidly towards the sea, but the average volume of water is small. The land is exceptionally fertile, and supply companies, for the protection of their overhead lines, have continually to cut down undergrowth and lop trees which very soon sprout again. Occasionally cyclones occur, but overhead lines are not exposed to ice and snow as in Britain and can be cheaply constructed.

Sugar is the chief interest, about 250,000 tons being exported annually, the greater proportion to England. Within recent years tobacco has been grown apparently with some success. The sugar factories, of which there are about forty, obtain almost the whole of their power requirements from the burning of the cane bagasse, which is the fibrous residue after the glucose has been extracted.

Telegraphic communication is available in every town and village of any appreciable size, and telephonic communication is provided in the principal towns. The time of sunset does not vary appreciably throughout the year, and artificial lighting is required from about 6 o'clock. The industrial and lighting loads do not overlap, but as the natives, who constitute the major portion of the consumers, retire to bed soon after dark, little advantage in increased revenue is derived from the early sunset.

Although electricity was introduced to the island in 1889, with few exceptions it is only within recent years that it has been used for anything but lighting, partly due to the lack of experience of the supply companies of other loads, but mainly because those consumers who could afford electricity for domestic purposes are relieved of the household tasks by native servants who turn out excellent dishes by means of charcoal braziers. There is no doubt, however, that once electricity has been introduced for a few domestic purposes, and its use encouraged by a suitable tariff, development will proceed rapidly in the chief residential areas.

A Variety of Systems

The supply to the public is given by authorised undertakers, each having a system differing from the others in frequency, voltage, or type of current. The advantages of standardisation will probably be greater here than in England. Local users must either carry their own spares for electrical plant and appliances, or put up with at least three months' delay until they can be obtained from Europe. The adoption of a standard system would also permit the linking together of the various undertakings at minimum cost. Future works and extensions to existing systems will follow the British standards, i.e., three-phase, 50 cycles, 400/230 V.

Each authorised undertaker operates over a specific area under statutory regulations. These areas differ considerably climatically and also in the capabilities of the inhabitants to pay for electrical service. Port Louis, the capital and port of the island, has a population of about 55,000, chiefly of the poorer classes, who, generally speaking, can only afford electricity for lighting.

The shape of the island bears a resemblance to the frustum of a cone, the altitude of the tableland where most of the sugar cane is cultivated being between 1,000 and 1,500 ft. The temperature, humidity, and rainfall vary appreciably between the coast and the tableland; along the coastal belt house heaters are unnecessary, but at altitudes of 1,000 to 1,500 ft. they are required for six months of the year, and are acceptable between sunset and sunrise the whole year round.

The tariff, and the use of electricity for lighting only, have influenced the construction of the distribution system and also the house wiring. The consumer pays according to the rating (averaging 25 W each) and the number of lamps. The smallest size of wire permissible and extremely light supports are used, *e.g.*, boiler tubes or rails. For consumers' installations No. 18 or 20 s.w.g., v.i.r. cable is used, the screw-cap type lamp with its own fuse adjacent being tapped direct from the outdoor overhead distributor through flying fuses, there being no main switch. The lamps are usually controlled, not by switches, but by being turned in the holders, a primitive but quite effective method.

Without cheap distribution and house wiring a supply could not be given to the Indian's thatched hut with its one or two lighting points; some latitude beyond the four per cent. margin of voltage regulation appears desirable for the supply to areas outside the residential limits, where a domestic or power load is unlikely. Immunity from fires is no doubt due to the average consumer's load being such that a 2-A service fuse is adequate.

The Principal Supply Company

The General Electric Supply Co., of Curepipe, is the largest supplier and the most favourably placed with regard to the potential domestic demand. This undertaking was established in 1889 with a 20-kVA steam set. Later the 1,000-ft. head of the Tamarin Falls, situated about four miles from the chief residential town of Curepipe, was harnessed, with a station capacity of 1,500 kVA, which will be insufficient if the domestic load is developed. At present there is no water storage, apart from a small reservoir, to take care of daily variations in the load, but enough water can be impounded by extending the present small dam across the mouth of the watershed above the falls.

A Diesel station is being erected, and the profits from the increased load will be appropriated for the construction of the dam. The Diesel station will ultimately take care of the peak load, which will occur during the lighting period. The station is to be erected at the extremity of a recently constructed 17-mile 22-kV transmission line which passes from the hydro station through the most densely populated and the business area of the island. This line will eventually carry the major load on the system. The alternator will be uncoupled from the engine and run as a synchronous motor for power-factor correction during the day power load; self-starting windings will also be embodied in the salient poles.

The Rose Hill Hydro-Electric Co.'s switching sub-station and (right) the Plaine Lauzun 1,000-kVA sub-station with two incoming 22-kV lines

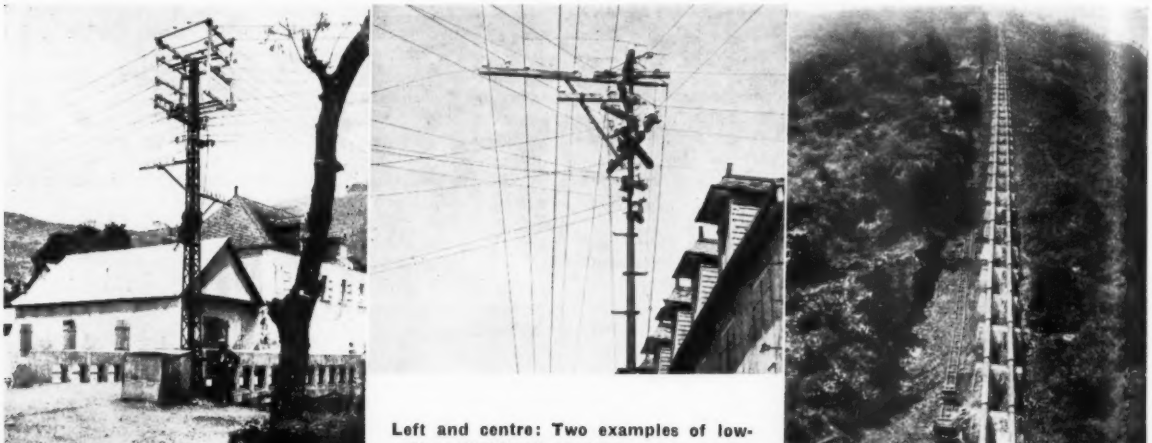
There are five other authorised undertakings, with maximum loads ranging between 20 and 250 kVA. The largest of these is the Rose Hill Hydro-Electric Co., which supplies the towns of Rose Hill, Quatre Bornes, and Beau Bassin.

House wiring is extremely crude, but up to the present there has been no justification for advocating better-class material or workmanship, particularly as the majority of the small consumers' houses are of a semi-permanent nature. With the extension of electricity for domestic purposes in the residential areas greater attention will have to be given to the material used and the workmanship, and this should operate in favour of British manufacturers whose goods are at present generally slightly dearer than those supplied by

foreign manufacturers. Some successful industrial power schemes have been accomplished recently; these should encourage the use of electricity in factories and workshops, and considerable interest is being shown in the costs of conversion to electric drive. A movement is afoot to popularise domestic electrical appliances, and, although an adequate supply for this purpose will not be available within the next nine months, there is certain to be a fair demand for these appliances within the next twelve months; British manufacturers should endeavour to establish their goods locally at the outset, and so gain the first-comer's advantages.

Some time ago the electrification of the 17-mile section of railway between Port Louis and Curepipe (where an average of thirty-five trains per day climb 1,800 ft.) was considered. Owing to the heavy capital expenditure involved in providing for the afternoon traffic, when the business people return to their residences up country, the results of the investigation were unfavourable.

The majority of the lamps sold, even the better grade, which are about the same price as British lamps or very slightly cheaper, are of foreign manufacture. I would suggest that the British lamp manufacturers should put on the overseas market a cheaper lamp in addition to the standard lamp. The bulk of the local lamp buyers (and it is probably the same in other Colonies) do very little reading or other tasks demanding a high standard of illumination. As the voltage regulation is usually poor, the life of the inferior lamp is quite good and its defects provide no justification for paying the higher price for the undoubtedly better British product.



Left and centre: Two examples of low-voltage distribution; right: a view of the General Electric Supply Co.'s pipe-line

Manufacturers and suppliers should endeavour to include prices in catalogues. There is a natural tendency in the Colonies for buyers and those responsible for drawing up a scheme to use as a reference a priced catalogue and to specify accordingly. For the benefit of the local trade purchasers net prices should be given, instead of inserting in the catalogue a discount slip which may be mislaid. Often the would-be purchaser is not familiar with an English catalogue, and rather than speculate on the meaning of the discount slip he orders from the manufacturer who quotes the lowest gross price.

Electric Brakes for Cranes. By C. H. S. Tupholme

BECAUSE of the certainty and ease with which electrically operated mechanisms can be controlled from a distance, mechanical brakes for all types of cranes have been almost entirely superseded by the electrical type, the safety of which is inherent. That is to say, the brake is automatically applied upon either failure of the supply, or, what may be even more dangerous, a break in the armature circuit of the motor when lowering under dynamic control. This feature is obtained only when series-wound brakes are used, and for this reason series solenoids are more suitable for the larger sizes. In addition, they are more rapid in action and their inductance is much less than that of shunt-wound solenoids.

A typical high-grade brake solenoid for d.c. service is the type "D.S." made by Allen West & Co., which is totally enclosed and weatherproof. The wiring is simple and an adjustable dashpot action is provided to apply the brake gradually and release it freely. The frame is split through the middle to provide easy access to the coil and connections, and the plunger can be easily set at its correct working stroke. In the event of the brake wearing and allowing the plunger to drop lower than its correct working position, this can be seen and the necessary adjustments made.

If series-wound solenoids are used in conjunction with small motors, say, of 5 h.p. and below, there is an appreciable reduction in motor speed due to the voltage drop in the large number of turns of fine wire on the solenoid necessary to give the requisite pull, and it is advisable to use shunt-wound solenoids connected across the lines. Also, if series-wound brake solenoids are used in conjunction with variable speed motors, the small current taken by the motor at the lower limit of speed may be insufficient to lift the brake.

It is essential that a low-resistance discharge path be provided for shunt-wound d.c. solenoids of the larger sizes on pressures of 220 V and higher, not only to prevent the occurrence of destructive voltage rises, but also to cause the operation to be quicker. The use of an economy resistance in connection with a continuously rated coil considerably increases the lifting capacity of the solenoid without affecting to an appreciable extent the holding pull. In the case of intermittently rated coils, the slight increase in the lifting pull does not warrant the extra complications. For larger capacities a standard line of Igranic ironclad d.c. solenoids is designed, either series- or shunt-wound, for pulls ranging between 250 and 1,000 lb. through 1 in.

A.c. Brakes

Owing to the difficulty of obtaining good speed control, developments in a.c. hoisting gear have been somewhat slow. However, by the use of what is the equivalent of two or more brakes and special connections varying with the service, it is possible to obtain control approximating to that obtained with the dynamic braking which is so popular with d.c. equipments. A brake magnet for use on two- or three-phase a.c. circuits is made by the B.T.-H. Co. As usually installed, the brake is applied mechanically by means of weights or springs. When the current is switched on, the solenoids draw up the plunger and so lift the weighted lever to which it is coupled, thus releasing the brake. When the current is switched off, the plunger drops and the brake is automatically applied.

The magnet is composed of two essential parts; a frame with a fixed magnet yoke, windings, and dashpot; and a plunger with a moving three-limb core attached. The plunger consists of a steel rod moving in guides in the frame, and is fitted with a piston for working in the dashpot placed underneath the frame. Two ratings are available for each magnet size. One, for crane or intermittent service, allows 120 operations per hour when the solenoids are in circuit for not more than five out of every fifteen minutes. The other, for continuous or heavy service, permits of 240 operations per hour.

Another brake solenoid for two- and three-phase, 25- to 60-cycle circuits is the Allen West type. The magnet is of the three-limb type, and the coils are arranged so as to balance the currents in each phase. The moving core forming part of the plunger is self-aligning, enabling it to bed correctly on the fixed yoke, thus securing silent operation and freedom from burnt-out coils. A single-phase a.c. brake solenoid operating

without noise or vibration at all voltages up to 500 and frequencies between 25 and 60 cycles has been developed by the Igranic Co. It can be designed for pulls ranging between 5 and 120 in./lb.

An interesting type of electro-magnetic brake control is the Metro-Vickers system used on cranes supplied to South Africa and the Great Western Railway, among others. Complete control of the load when lowering is obtained automatically by suitable stepping on the first three notches of the controller without the use of any rheostat or potentiometer. With the very high light-hook speed (300 ft. per min.) which is obtained with the type of motor employed, very heavy currents would be developed by the motor when bringing the controller handle back to the low speeds if potentiometer or rheostatic control were employed. With the electro-magnetic system these currents do not exist, and the duty of motor and controller is reduced as a result.

In this system the magnetic brake is provided with both shunt and series coils. The shunt holds the brake off and the series coil, which is excited with part of the armature current, gives a floating characteristic to the brake when the shunt coil is unexcited. The series coil only, therefore, is excited on the first step of the controller on the hoisting side and on the first three steps on the lowering side. On all other steps the shunt coil is also excited and the brake is held definitely off irrespective of the current in the series brake coils.

When lowering on the first three notches the floating action of the brake may be described as follows: (a) load stationary, power off, brake on; the action of the excitation is to lift the brake. (b) Power applied to the motor and the series coil of the brake; the brake is now lifted off and the motor armature revolves; the load begins to move. (c) The motor accelerates in speed and current taken from the line decreases, but insufficiently to hold the brake off against the brake springs, which tend to force the brake on. (d) The motor current increases, due to the artificial brake load, and this increased current in the series brake coil then tends to lift the brake off again, the cycle being repeated indefinitely. A centrifugal brake is embodied to limit the speed to a safe value.

Two well-known electric brakes for crane service are the type "M" magnet-operated device for d.c., and the type "R.S." motor-operated type for a.c. service, both these brakes being of Igranic design. The type "M" carries out its work with a quick, steady pressure which brings the motor to rest by a spring which, situated in the centre of the coil and eliminating all toggles, bell-cranks and levers, tends to force the armature and magnet apart. The force exerted acts directly in line with the centre of the brake shoes, so that the wear on the linkwork is reduced to the minimum and the retarding torque on the brake wheel is the same in both directions of rotation. Another feature which tends to minimise wear is that the armature and magnet are both movable and rotate on the same centres.

A Motor-operated Brake

The type "R.S." brake for a.c. service is a reversible shoe brake operated by a special squirrel-cage polyphase torque motor. The construction is extremely simple. A small pinion on the torque motor engages with a toothed sector which is linked to the arms carrying the brake shoes. When the torque motor is connected to the line the motor revolves until the brake is released. It then stalls and maintains the brake in the released position until power is disconnected. For each cycle of operation the motor turns approximately two revolutions. The brake is applied by means of a variable spring.

When these brakes are used on reversing service the torque motor should be connected to the line between the main switch and the reversing switch on the main motor controller. If the controller does not have contacts for handling the brake, a double-pole solenoid switch may be used as a relay to handle the torque motor circuit.

Recently, a brake-releasing magnet with an improved impulse- and shock-damping device has been designed by Brown-Boveri, and is designated type "L.B." There are two main parts of this apparatus: a cast-iron casing containing the movable core, the air dashpot, and the damping piston; and the upper part, or cover, with stationary armature, the coils, and the terminal plate. The damping piston and dashpot are ground to an accurate sliding fit, and a leather packing ring is fitted to the piston to prevent any escape of air. For the same reason the openings through which the piston rod passes are rendered air-tight by glands.

Some Driving Forces in the Industry: Mersey Cable Works, Ltd.

1. Mr. T. J. Boorne, Lancs and Cheshire representative. 2. Mr. W. Arthur, sales manager. 3. Mr. W. A. B. Ames (*Lafayette*), representative for Scotland. 4. Mr. F. Summers Askew, chairman. 5. Mr. W. S. Taylor (*Elliott & Fry*), founder and managing director. 6. Mr. H. H. Leage, London representative. 7. Mr. G. T. Pemberton (*Whitlock & Sons*), Midland representative. 8. Mr. G. D. Chapman, representative for South-West England.

Earthing the Neutral Point. By W. T. Taylor, M.I.E.E.

Its advantages in transmission and distribution systems

THE greatest hazards with overhead line transmission are due to abnormal impressed and induced voltages at high frequency, and one of the worst conditions of excessive voltage and frequency propagation is that from an arcing earth on an isolated neutral system.

Fig. 1 represents a e.h.v. three-phase circuit with unearthed neutral consisting of distributed inductance (L) and capacity (C) in the line and transformers. The electrostatic capacity of two of the three phases, B and C, against earth is C′ and C″, and the respective voltage to earth is E′ and E″; for a voltage E between phases these would normally be equal to $E/\sqrt{3}$ for a symmetrical system. If the earth is accidentally brought within striking distance of phase conductor C′, a discharge will occur over that point forming an arc. The circuit of the impressed voltage E now places condenser C″ in series with the parallel circuit of the arc and condenser C′, which rapidly discharges; for this condition circuit voltage E′ is decreased and E″ increased. The charge on condenser C″ increases as the result of the higher voltage, and is oscillatory owing to inductance in the line and transformers. This causes the voltage on phase B to become greater than the normal above earth.

The discharge current through the arc will decrease with the fall in voltage, but the voltage drop across the arc will increase. When E′ is equal to the voltage drop across the arc, the latter will be suddenly extinguished, and potential E′ will again increase, and, owing to the inductance in the circuit, the new charge will be oscillatory. When voltage E′ reaches the value necessary to break down the insulation, a further train of oscillations will result and overlap previous oscillations. The arc will be broken and re-established so rapidly that voltage cumulation of great magnitude may occur and failures show up at widely different parts of the system.

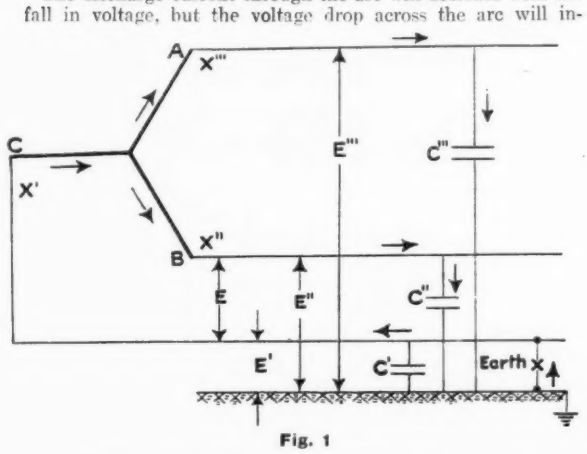


Fig. 1

Results of a Cracked Insulator

For instance, if an insulator on the line should be cracked, a spark would occur and an arc would instantly develop. The electrostatic charge of the accidentally earthed phase would discharge to earth as current and the voltage would drop to earth value at the point of fault. Voltage on the two sound phases would increase to E above earth and the electrostatic charge to earth consequently increase from normal potential $E/\sqrt{3}$ to E. The current from conductor C to earth ceases and the arc fades out, but the conductor is instantly recharged and raised to normal potential $E/\sqrt{3}$ above earth, while the two sound phase-conductors A and B discharge from E to $E/\sqrt{3}$. The voltage on the defective phase C again increases until the insulator is broken down by an arc, when it again discharges to earth, thus repeating the oscillations until the arcing earth clears itself or the circuit is disconnected.

Due to the recurrent arc the two sound phases will oscillate in voltage to earth at a frequency of perhaps thousands of cycles per second, and before the circuit can be disconnected the voltages may be built up to destructive values. Where long e.h.v. lines are operated in parallel, excess voltage conditions may be intensified when the isolated neutral system is used. We may thus, at any instant, have trouble of this nature if a point on the line suddenly drops to earth potential because of a faulty insulator or bushing or other cause, yet the circuit may be charged at very high potential at neighbouring points.

The ultimate voltage may be more than seven times the crest value of the line to neutral voltage, but the magnitude will depend on whether the arc breaks down when the high frequency current or when the power frequency current in the arc passes through zero. The maximum voltage due to the initial arc will be around 2.5 times, or $\sqrt{12}-1.0$ on the two sound phases.

With the earthed-neutral system there is no possibility of recurring oscillations developing and maintaining dangerously high voltages. If the earth is brought near the conductor, the current passing over the arc is fixed by the reactance and resistance, and does not depend upon the electrostatic capacity. The potentials E′ and E″ (see fig. 2) will change, depending on the impedance drop in the circuit, and causing a small oscillation reaching a maximum of $\sqrt{12}-1.0$ at fundamental frequency on the sound phases. And for the earthed-neutral system the resultant voltages will remain fixed with stable conditions for the arc maintained at system frequency. A dynamic current to earth will flow, the value of which depends upon the impedance of the circuit through the earth, the line and the transformers. This discharge to earth results in an impedance drop throughout the circuit and a consequent lowering of the voltage. As the resultant arc is in series with the reactance ($2\pi fL$) of the circuit a recurrent arc is quite remote. The fault current to earth is at fundamental frequency, and the effect of this current is less harmful than that for the isolated neutral system since the product fE alone in $2\pi fCE$ may reach 10,000 or more.

More Efficient Protection

Relay protection is more positive. A higher degree of selectivity and prompt isolation of faulty circuit are secured. When operating e.h.v. circuits in parallel the dielectric stresses are not increased owing to the condition of capacity in series; as with the isolated-neutral system. The earthed neutral system also permits of a lower setting of the lightning arrestors, and relieves the system of excess voltage at a much lower value.

Where a lower voltage, isolated-neutral system overhead line parallels an e.h.v. line for a considerable distance, an excess voltage may be induced on the lower-voltage line whenever the higher-voltage line becomes unbalanced (as when an earth fault occurs on any phase of the latter), but this is unlikely when the lower voltage line has a neutral earth.

The frequency of an arc to earth may be a thousand times greater where the neutral of the system is unearthed. Where the neutral is solidly earthed a phase conductor of considerable length may be accidentally charged at full phase voltage without shifting the static neutral; a phase to earth fault may not cause much more unbalanced current than a phase to earth fault on the isolated-neutral system, but the effects on the latter system are usually worse.

With the isolated neutral system a fault generally starts between phase and earth, but quickly develops into a phase to phase fault because it is rarely of a solid-earth nature. With the earthed-neutral system a phase to earth fault is instantly detected and the faulty circuit cut out.

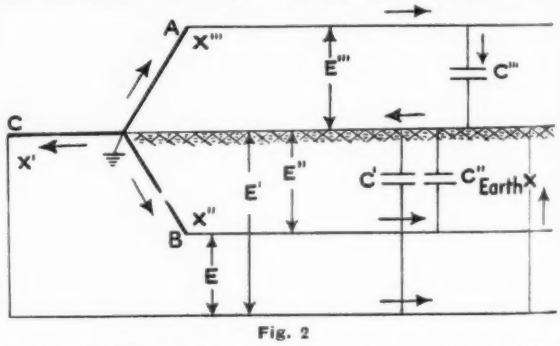


Fig. 2

Multiple Earthing

A long line feeding a considerable area will generally warrant the use of more than one earth connection, notwithstanding the possible existence of slight interchanges of current over certain of the earth connections due to moderate unbalance of the current or to other cause, but the heating effect of these small currents will be negligible.

As current to earth distributes itself over a very large area the earth return circuit acts as parallel conductors of immense cross-section and thus assists in securing permanency and reliability of a low-potential to earth over greater areas with greater effect. Where the true earth plane is everywhere at the surface, conditions are simplified and the protection is greater. Thus, with a good earth connection and where the true earth plane is at the surface, the effective height of a given line is the safest when it is the lowest and nearest to the true earth plane.

Reinforced Concrete Standards. By Baird Dennison

Their use for traction and lighting purposes

REINFORCED concrete being a much newer material for lighting standards and tramway poles than spun iron or weldless steel has not followed that baneful tradition of flamboyancy in industrial design which dates from the closing years of the previous century. The nature of concrete makes it easier to mould in simple logical shapes than complicated ornamental forms. Tubular steel poles erected without decorative accessories look unfinished as they lack proper caps and do not taper uniformly. With concrete there is no temptation to add ugly "embellishments" because the poles look, and are homogeneous. Finials and bases are cast as integral parts of the poles, and to any pattern that may be desired.

Holes for nuts to anchor wires to do not have to be drilled *in situ* because the necessary eyes have already been permanently embedded in the shafts. The only supplementary fittings required—and in some models even these can be dispensed with—are small iron bands on which to stay span and guard wiring. The need for painting and repainting disappears altogether, with the result that maintenance is reduced to a minimum. Another advantage is that as concrete poles can be made much taller than is usually practicable with tubular steel, the same standards can serve for both highway-lighting and trolley-wire suspension.

Single-pole Suspension

Though concrete poles are more often used in pairs for ordinary span-wire construction, they are also found on routes where side or centre-poles have to be employed. With single-pole suspension the projecting arms can be either precast-concrete sleeve-brackets of the rectangular gibbet type; thin horizontal steel bars with diagonal stay-rods; or semi-circular wrought-iron segments attached to metal collars, or bolted through the shafts. Y-shaped monolithic centre-poles—a model which makes a most graceful lighting standard by doubling the height of the shaft—have been adopted on the Heerstrasse section of the Berlin tramways, where the track is fenced off from the road and turfed like a bowling green. Very elegant concrete centre-poles with perfectly plain slender iron brackets, both straight and curved, may also be seen in Germany, Chemnitz, Duisburg, and Cologne.

Round-section concrete side-poles have been adopted by the German Reichsbahn for supporting the single-phase catenary suspension of its electrified main lines in Silesia. Now that the Ministry of Transport has standardised the 1,500-V d.c. overhead system for all future railway electrification schemes, except in the London suburban area, and trackless-trolley mileage is increasing so rapidly, British precast-concrete manufacturers would be well advised to turn their attention to centrifugally-cast concrete traction-poles. On the Continent concrete poles are now almost invariably specified for all tramway extensions and renewals. The usual model is of plain round section, though rectangular slotted types are sometimes preferred for span-wire routes with comparatively light traffic.

Methods of Finishing

For lighting standards the shafts are usually of perfectly plain round section, round section with grooved or reeded pattern, or plain hexagonal, octagonal, or even duodecagonal section. The base can be either a more or less plain cylindrical enlargement of the shaft or a rather heavier, splayed-out pedestal decorated with simple line-mouldings. The plainer the shafts and bases the better they suit the nature of the material. With the larger kind of public candelabra for busy urban thoroughfares, finish naturally becomes of considerable importance. By the use of carefully selected aggregates and suitable coloured cements any local stone, or particular surface tint and texture that may be desired, can now be quite successfully reproduced.

A bush-hammered "freestone" finish—which gives a clean, sparkling effect like a fine, evenly dressed, whitish-grey granite—is generally more appropriate for large cities. This is obtained by using a mixture of snow-white Portland cement, silica sand, and white granite or marble chippings for the immediate surface "skin" of the mast. Being only about half-an-inch thick, the finer facing does not materially increase the cost, but it is not a veneer, since it forms an indestructible part of the concrete shell.

Central Suspension

Where centrally slung lighting is employed the standards are more or less identical with span-wire tramway poles, only somewhat taller. For traffic islands, street refuges, &c., triple-headed candelabra are often adopted, which in some cases serve as tramway pull-off poles and for supporting synchronised electric public clocks. The double-branching candelabra in the Augustusplatz, Leipzig, are over 50 ft. high. For ordinary pavement lighting on less important streets there is a wide range of types with either straight or curving-over concrete brackets, *e.g.*, the handsome new standard models in Hamburg and Stockholm, where metal standards have been abandoned.

Some examples of reinforced-concrete tramway and lighting standards
1. A three-light standard in the Dellplatz, Duisburg. 2. Octagonal poles on the Oberhausen municipal tramways. 3. Neat lighting standards at Stockholm. 4. A tall mast bearing a powerful reflector fitting at railway sidings in Piacenza, Italy

Yet another type, and one that is for some reason cast without any base at all, may be seen in the public squares outside the central stations in Cologne and Stuttgart. This is the so-called "mushroom" model, which looks like a sailor's flat cap and contains mirror-glass reflectors that throw down a clearly defined cone of light. Very lofty and slender concrete masts are used in Italy for mounting the powerful prismatic reflectors required for illuminating large railway sidings and marshalling yards. In Hamburg the short posts to which the three-colour traffic signals are fixed are also of concrete, and there is no reason why the same material should not be adopted for supporting the shields of automatic railway signals. In France and Italy concrete has been used successfully for telegraph poles for twenty years.

Concrete lighting standards have hitherto been used in Great Britain mainly architecturally, or in a more or less experimental manner. Probably the earliest English examples are the flat-topped, metal-framed lamps on the Lea Valley Viaduct of the North Circular Road—where, however, as on several more recent concrete bridges, the columns cannot properly be described as "precast," since they form an integral part of the monolithic balustrading. Among the latest and best are those which illuminate the open platforms and courtyards of the surface stations on the new northern and western extensions of the "Underground."

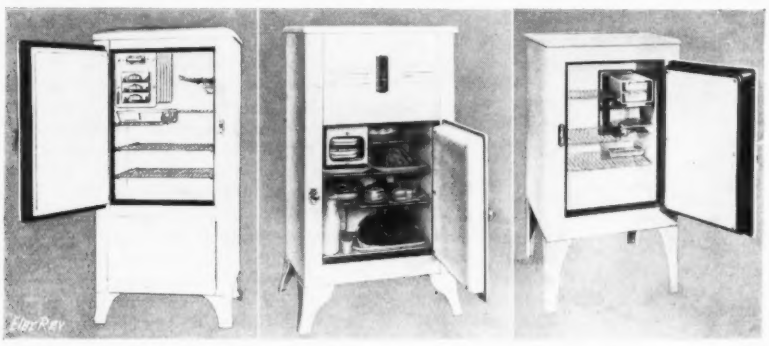
Cast-concrete lamp-posts for street lighting are less expensive in first cost than cast-iron or weldless steel, require no painting or maintenance, and as a rule are far neater.

The principal Continental firms which specialise in the design and manufacture of concrete masts for traction, lighting, and power-transmission purposes, are the Contractor Company of Stockholm, Sweden, the Dycherhoff and Widmann Stampfwerke of Dresden, Carstanjen and Cie. of the Duisburger Cementwarenfabrik, in Germany, and the Societa Cementi Armati Centrifugati of Trento, in Italy.

New Refrigerators

Many changes of design in this season's models

PURCHASERS of refrigerators this year should have little difficulty in finding models to suit their exact requirements. In addition to the already large number of existing types several new models have been placed on the market, and in many cases important improvements and modifications in design have been introduced.



The Kelvinator "K60," the Marco "DR4," and the new Electrolux

"Quality before price" has been the policy of KELVINATOR, LTD., 258, Gray's Inn Road, W.C.1, in developing a new range of entirely automatic refrigerators. Several improvements have been made to last year's models, and one entirely new model has been introduced. All types have been fitted with a redesigned cooling unit which, besides taking up less space, embodies a toggle switch enabling defrosting to be carried out without taking the food out of the cabinet or in any way interfering with the normal working of the refrigerator. A specially fast freezing tray, in which water can be frozen in eighty minutes, is incorporated.

The exterior finishes remain unchanged except in the case of the "P.K.70, which now has white porcelain on two coats of enamel. The ice-making unit has been redesigned in all models giving greater food storage capacity and shelf area.

Taking each model individually, many alterations have been made. The "R.42" (40 gn.) supersedes the "K.4," the external dimensions being slightly smaller than last year—25 in. wide by 24⅜ in. deep by 49½ in. high. Model "K.50" (50 gn.), replacing the "K.5," measures 28½ in. by 25⅜ in. by 51½ in., and is provided with a sliding removable egg rack under the top shelf.

Model "K.60," a newcomer priced at 60 gn., has almost the same external measurements as the "K.50," yet it has an extra cu. ft. of storage space and almost 4 sq. ft. of extra shelf area. It will make 6¼ lb. of ice per freezing.

The "K.7" is replaced by the "P.K.70," which retains the external measurements of 31⅛ in. by 25¾ in. by 57 in., but has a food storage capacity of 7.3 cu. ft. and a shelf area of 14.9 cu. ft. The "S.7" and "D.11" have also been modified and are priced at 95 and 140 gn. respectively.

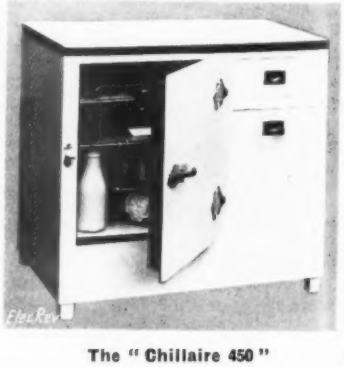
A range of three domestic refrigerators of 4, 5 and 10 cu. ft. storage capacity, selling at 34, 42, and 60 gs. respectively, has recently been placed on the market by MARCO REFRIGERATORS, LTD., Manor Works, Rowan Road, Streatham Vale, S.W.16. The most notable changes in design are the use of 7-in. legs and the position of the compressor unit at the top of each refrigerator, which has led to a reduction in the external dimensions of all models.

In each case the interior is of one-piece porcelain enamelled sheet steel, and the exterior of "Bonderised" sheet steel with white cellulose finish. The compressor is air cooled and its floating suspension renders the equipment vibrationless. Cork heat insulation is used.

The "D.R.4" (external dimensions 26 in. by 19 in. by 49 in.), the "D.R.6" (28 in. by 19½ in. by 57 in.), and "D.R.10" (42 in. by 21 in. by 48 in.) supersede the "Whitehall" and the old "D.M." series, and have entirely different specifications.

FRIGIDAIRE, LTD., Edgware Road, The Hyde, Hendon, has adopted a new kind of insulation known as "Stataflex" in its 1933 models. It is claimed for this material that a thickness of 2 in. has insulation properties equal to that of 3½ in. of ordinary material. An effective demonstration has been arranged at the Ideal Home Exhibition, by insulating with "Stataflex" a vessel containing boiling water.

ELECTROLUX, LTD., 153-155, Regent Street, W.1, has extended its range of domestic refrigerators by a second air-cooled model. It has a storage capacity of 2 cu. ft. with a shelf area of 4 sq. ft., and costs £28 10s. An external indicator affords nine different automatically controlled temperatures apart from defrosting. The machine is of the absorption type, and the heating circuit is thermostatically controlled. The external dimensions are 21⅝ in. wide by 23⅞ in. deep by 41¼ in. high.



The "Chillaire 450"

MESSRS. ORME, EVANS & CO., LTD., Wolverhampton, are producing a new model known as the "Chillaire 450." This has a food storage capacity of 4½ cu. ft., and two drawers fitted in the side and the porcelain enamelled steel top can be used as a table. The price is 33 guineas.

Synthetic Resin From Coal

FOLLOWING on the production of a new moulding powder derived from rubber (ELEC. REV., March 24th, p. 419) comes information of the synthesis of a new plastic material from a still more unexpected source: coal, or its distillation products. A translation in the *Chemical Age* of a paper published in *Brennstoff-Chemie*, by Franz Fischer, Otto Horn, and Hans Küster, describes research into the use of lignin, which is a large constituent of wood, peat, and hard coal, and may constitute anything from 66 per cent. to 90 per cent. of various brown coals. Artificial gums can be produced by the action of phenols on lignin, particularly if this action is assisted by the presence of one per cent. of concentrated hydrochloric acid.

Coals digested with hot phenols first swell and then in part dissolve, brown coal giving the most satisfactory products for moulding at 350 kgr. per sq. cm. at a temperature of about 150 deg. C. Approximately 12 per cent. by weight of phenol (or its homologue, cresol) is the optimum quantity, kneaded with the lignin or coal in a mill for prolonged periods at about 80 deg. C. By then distilling off the excess acid in a vacuum, the resultant dry precipitate is in a suitable condition for pressing. Not only is it possible to produce moulding materials by the action of phenols and cresols, but organic bases, such as aniline, naphthylamine, pyridine, piperidine and chinoline, also make strong pressed articles.

The bond between base and lignin is not chemically strong, for part of the volatile constituent can be driven off by distillation with steam. The use of a strong condensing medium, such as a strong acid, is not permissible, however, where the product is for electrical use, since its insulation qualities are thereby impaired. The action of the material during moulding differs from that of phenol-formaldehyde resins, which first melt and then undergo transformation. "Kolonit," as it is to be called, does not melt or change in condition, and may therefore require a different technique of manufacture from "Bakelite," besides being probably capable of use for a wider range of articles.

Its tensile strength is equal to that of existing plastic materials, but it has, it is claimed, excellent machining properties—it can be sawn, filed, drilled, turned in a lathe, and polished to an unusual degree. Its insulating properties are stated to be very good, and its electrostatic behaviour is very similar to that of hard rubber, whether it is produced by the action of cresylic acids or organic bases. The total cost of production, which includes expenses for labour, coal, and phenol, is stated to be of the order of 1d. per lb.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

The Economics of Hydro-electric Turbines

IN Dublin recently Mr. F. O'Kelly read a paper before the Association of University Electrical Engineers, giving details of the plant at Ardnacrusha (Shannon scheme). Space permits at present only reference to the author's remarks on the economic advantages of a combination of Francis and Kaplan turbines.

The plant in the Ardnacrusha station consists of three vertical turbines of the Francis type, each designed for an output at the turbine coupling of 30,000 h.p. At heads of approximately 34 metres an individual maximum output of 38,000 h.p. is obtained. Allowing for generator losses, the total output at the lowest possible head, 25 m., is 53,500 kW, while at 33 m., the maximum head anticipated, the total output of these three turbines would be 85,000 kW, a notable difference of 31,500 kW. Unfortunately the conditions for maximum head are those which are likely to be attained only at times when total output is not important, and conditions for minimum head are those likely to occur when the total output is of extreme importance, namely, for winter peaks. At present the maximum output for winter conditions can be taken as from 53,500 to 60,000 kW.

Whereas the total output is important for winter conditions, irrespective of efficiency, for summer conditions it is of no importance as yet, but efficiency of running becomes just as important as the fuel efficiency of a steam turbine, because water storage may run out. When that is threatened the auxiliary (Dublin) steam-power station has to be brought in. Hence every cubic metre of water saved may mean so much coal saved.

The existing storage is 250 cusecs, which at present is sufficient during the whole summer period except in an abnormally dry year; but as the load develops any improvement that can be made in efficiency at light loads will be of great importance. This is being accomplished at Ardnacrusha by the provision of a fourth generating unit equal in capacity to the others, but of the Kaplan type. The special feature of this type is the maintenance of a much higher water-efficiency over the working range than is possible with the Francis type.

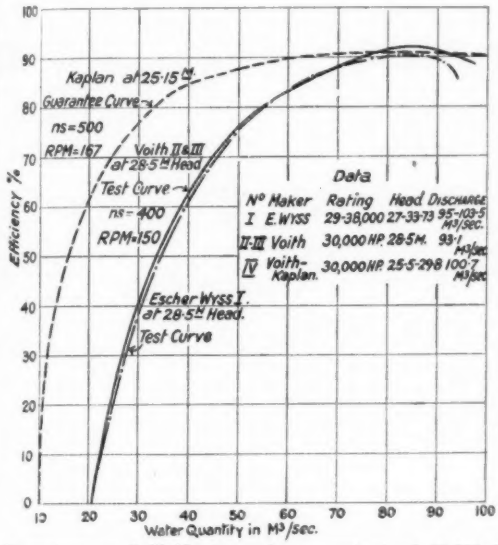
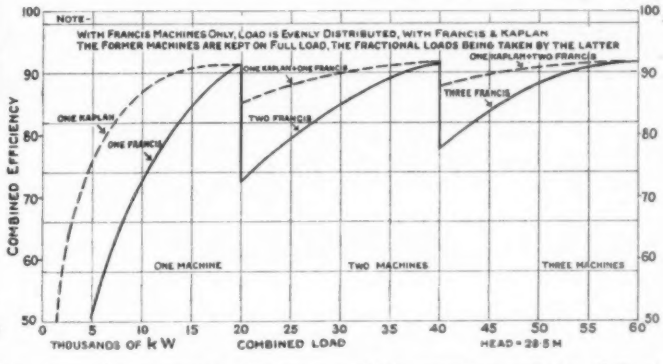


Fig. 1 (left): Curves showing relative efficiencies and water quantities of the existing turbines and the new Voith-Kaplan unit at Ardnacrusha. Fig. 2. A comparison of the combined efficiencies of Kaplan & Francis turbines against Francis turbines only


NOTE:-
WITH FRANCIS MACHINES ONLY, LOAD IS EVENLY DISTRIBUTED, WITH FRANCIS & KAPLAN THE FORMER MACHINES ARE KEPT ON FULL LOAD, THE FRACTIONAL LOADS BEING TAKEN BY THE LATTER
COMBINED EFFICIENCY
ONE KAPLAN
ONE FRANCIS
ONE KAPLAN+ONE FRANCIS
TWO FRANCIS
ONE KAPLAN+TWO FRANCIS
THREE FRANCIS
ONE MACHINE
TWO MACHINES
THREE MACHINES
THOUSANDS OF kW
COMBINED LOAD
HEAD = 28·5 M

Economical running at Ardnacrusha at any load from, say, 7,000 kW up to the full output of four machines will be obtained by letting the Kaplan turbine carry the fractional loads and keeping the others fully loaded. The curves reproduced above make this point clear.

From fig. 1, showing the efficiency of combination of the Kaplan with one, two, or three Francis turbines, it is seen how increased efficiency is obtained from zero to 60,000 kW, the effect being more pronounced at low than at high loads. It is expected that the average consumption of water in summer will be decreased by about 10 per cent., thus giving an increased output of about 6 million kWh.

The 1,500-V Overhead d.c. Traction System Justified

THE discussion on the electrification of the Manchester, South Junction, and Altrincham railway at the Institution of Electrical Engineers in London on April 6th (Lt.-Col. F. A. Cortez Leigh's paper, which was referred to last week) was opened by Sir Josiah Stamp, chairman of the L.M.S. Railway Co., who commented on the scheme and the manner in which it had been carried out. It was an interesting experiment and full of lessons for the future. On the technical and operating sides the conditions were exacting. Novelties had been introduced and those who had recommended them had no reason to be ashamed.

Mr. H. W. H. Richards thought that a certain amount of criticism regarding the existence of two standard systems was bound to continue. A recent N.E.L.A. report showed that the overhead system predominated, only about 15 per cent. being third rail. The author's conditions of 10 h.p. per ton and 0.75 mile spacing between stations approached "Underground" service closely. High-powered motors provided flexibility; more and more power per ton would be needed in future, and it would be well to have some in reserve. The ratio between electric motor and Diesel traction was about 6 to 10 b.h.p. per ton, and with oil engines one half the power installed was needed to transport the power equipment itself.

Contact-wire Considerations

Prof. W. Cramp dealt with overhead trolley wire wear. The author's figures agreed with those of the Paris-Orleans Railway, and in the U.S.A. it was the practice to gauge the wire each month to avoid failure. He had discovered 118 papers in four languages on this subject, but the information needed co-ordinating. Tests which he had carried out at Birmingham University had produced remarkable results. For sparkless contact the wire must be lubricated; the amount of lubrication necessary was exceedingly small, but it must be automatic. The results differed greatly when oil and grease were used. All greases, even those containing graphite, were very good insulators, but solid oils of low electrical resistance were now obtainable.

The Power Factor Question

Dr. C. C. Garrard remarked that the paper had shown the Railway Electrification Committee's recommendations to be still up to date. The author could not have obtained such results except by the use of multiple-unit trains. He had shown great courage in the use of 1,500 V for what was after all a suburban line, and he had proved the great suitability of mercury arc rectifiers for 1,500-V railway work. Power factor was important and would need attention, as it could not be compensated for in the same way as when rotary convertors were used.

It was not desirable to have too fine voltage regulation with rectifiers, and circuit-breaker research was needed to determine why larger capacity switches were required for rectifiers than for rotary convertors. Whether inductive interference filters were really necessary with rectifiers needed further discussion; only in a small proportion of cases could such filters not be dispensed with.

Mr. G. H. Nelson said that this was the first line to comply with the Ministry of Transport's requirements, and no more difficult piece of track could have been found on which to try out the 1,500-V d.c. overhead system. With grid control of rectification the need for high-speed circuit breakers vanished and switching generally became simpler. The railways must meet road traffic competition, but road vehicles were written

off in four years, whereas electric railway stock was expected to last for twenty-five years. Was that economic?

Mr. B. G. White suggested that different types of overhead equipment might have been experimented with. The weight of compartment type stock (8 cwt. per passenger) must be reduced to compete with road vehicles. This could be accomplished by the use of the "Underground" type of coach, and better balance might result from placing the motor coaches in the middle instead of at the ends of the trains. One line with which he was concerned depended entirely upon mercury rectifiers.

Mr. J. C. Read acknowledged the author's assistance in establishing the rectifier in this country, and gave operating results. Apart from two minor adjustments, no attention had been needed. Repeated overloads exceeding five times full load had been carried for periods of ten seconds at a time and there had been no trouble whatever. He did not think any other rectifier in the world had been so drastically tested under service conditions. Its operation suggested that in future economies could be made by the use of single-unit sub-stations more closely situated. Mr. A. L. Fielding drew attention to the possibility of the rectifier cooling water causing corrosion, and thought that the use of bronze alloy overhead contact wire would enable the span length to be increased, which would reduce the cost of overhead structures.

Mr. F. M. Jackson described the design and construction of the train motors, which had all-mica insulation, and the manner in which compressed air had been employed to assist lubrication. Mr. H. Rissik thought that general electrification on the same lines as the scheme described would be advantageous. Had the author any cause to change his view about 1,500 V? Abroad experience seemed to indicate that 3,000 V had certain advantages.

Lt.-Col. F. A. Cortez Leigh, in reply, described how constructional obstacles had been overcome. Operation was not easy, as there were as many steam train movements as electric over the line. He was sure they were right in adopting 1,500 V. If they had known at the beginning what they knew now, they would have used more rectifiers. They were carrying passengers in comfortable stock in the shortest time. The journey time was about half that of any other public service by road or rail.

Electrical "Divining"

GEO-ELECTRICAL methods of prospecting depend on the marked differences in the resistivity which exist between adjacent geological formations, these differences being produced by variations in the porosity of the rocks and in the nature of the saline solutions which they contain. Minerals with a metallic lustre usually have a low resistivity. The variations in resistivity are revealed by the anomalous flow through the ground of an applied current, and the work consists in determining the current flow and interpreting the anomalies in terms of geological structure. More precise methods of field procedure should place interpretation on a quantitative basis.

The electric kitchen at Casani's Club mentioned on page 534

The usual methods employed are described in the paper by Mr. J. McGarva Buckshaw which was read before the Meter and Instrument Section of the Institution of Electrical Engineers in London on April 7th. They are the surface-potential (*i.e.*, resistivity, equipotential-line, equiquadrature, &c.) and inductive methods at high or low frequencies, in which the current distribution is examined by means of the magnetic field associated with it. The methods may be applied to the location of good conducting ore bodies, faults, and dykes, to the measurement of depths, and also for the plotting of sub-surface contours. In favourable circumstances sulphide bodies may be detected by the natural currents which they produce (spontaneous-polarisation method).

In spite of certain disadvantages in some areas, electrical prospecting already has a great number of successes to its credit, and the proportion of successes will probably increase, since the phenomena are now understood to a greater extent than formerly. Its applications are not confined only to the needs of the mining engineer. The determination of the depth to bedrock for dam foundations has been carried out on several occasions, while in arid areas water-supply problems have been successfully solved.

Even in electrical work the science has its uses. In the transmission of power in which an earth return is employed, the transmission line must be laid out to cross areas of low resistivity so that the return current is confined near the line, thus avoiding interference with local telephone communication. A resistivity survey of the area through which the line is to pass is the only way to determine the best route for the line. Another problem which has been successfully solved is the location of corrosion centres in pipe lines, the principles employed being very similar to those used in the spontaneous-polarisation method. The subject will probably find many other applications, and there is no doubt that, when conditions improve, every advantage will be taken of its possibilities.

The Popularity of the Trolley Bus

ELECTRIC trolley-omnibuses are discussed in the paper by Mr. C. J. Spencer which was read at a joint meeting of the Institution of Electrical Engineers and the Institute of Transport in London on April 10th.

The change which has taken place during the past few years in the public view with regard to trolley-buses seems somewhat remarkable, and the author suggests that this is attributable to the merit of this particular form of traction. In most cases these vehicles have replaced tramcars, which were decidedly out of date and, in many cases, operated over single tramway track with passing loops—at all times an unsatisfactory method of transport—and critics would undoubtedly hold the view that the trolley-bus has come into favour largely because it is undoubtedly much superior to the single-line tramway operation which it has replaced, and not on account of its superiority over, say, the petrol bus. But there may be room for more than one view as to this aspect of the subject. Though this system of transport was invented in Germany or Italy, the greatest development has taken place in Great Britain.

Ten years ago there were in this country forty-seven miles of electric trolley-bus routes open for traffic. At the present time there are approximately 256 route miles operated on this system and extensions are taking place at a rapid rate. The following extracts from the published returns of the Statistical Department of the Ministry of Transport give some idea of the development which has taken place in ten years:—

Year.	Route miles operated.	Car miles.	Passengers carried.
1921-22 ...	47	1,374,444	9,879,730
1931-32 ...	256	19,739,000	184,373,000

The growth of the system is not confined to this country; there are to-day in the United States 135 miles of route open for traffic, and world-wide interest is being shown in this form of transport, particularly in the Dominions.

The author compares modern design with that of twenty years ago, showing how the designer is beholden to pioneers who so wonderfully developed the petrol vehicle. The weight of the electric motor has been reduced from 70 lb. to 12 lb. per h.p.; while normally rated at 80 h.p., it is capable of giving 160 h.p. for short periods; methods of control have developed considerably. The traffic, commercial, and financial aspects of the Metropolitan and London United systems are considered.

Throughout the country the maintenance costs of electric trolley-buses are lower than those of petrol buses when working in similar circumstances. The author does not stress the relative costs of operation too far. If the cost of operation per car mile is the same in both cases, the chief advantage of the electric trolley-bus is its extraordinarily smooth and silent operation and its odourlessness, plus its acceleration and flexibility compared to a tramcar.

The inhabitants now served by these buses are undoubtedly very pleased with the service. It has proved a popular innovation. Perhaps cynics would say that the real popularity of the innovation lies in the scrapping of the tramcar rather than the installation of the new type of vehicle. That may be true. Certain it is that they show a decided preference for the electric trolley-bus.

The great need is for a vehicle of larger capacity if the electric trolley-bus is to replace the tramcar on busy routes. Evolution in design is tending in that direction.

Mechanical Cable Laying

MECHANICAL methods of laying cable, with special reference to the mole-drainer, are dealt with in the paper by Mr. R. N. Hamilton which was read before the London Students' Section of the Institution of Electrical Engineers on April 11th.

An agricultural plough has been used to excavate the trench prior to laying the cable by hand. At Coneysthorpe, Yorkshire, about a mile of trench 18 in. deep was cut by Post Office engineers. Trench-digging machines do not appear to have yet been applied to cable work, although they would seem to be eminently suitable where extensive work is in progress. These implements, which are, in effect, large ploughs, will excavate 750 to 1,000 yards per hour of a trench 18 to 24 in. deep and about 2 ft. wide at an overall cost of 0.16d. per yard run, compared with a manual labour cost of over 4d.

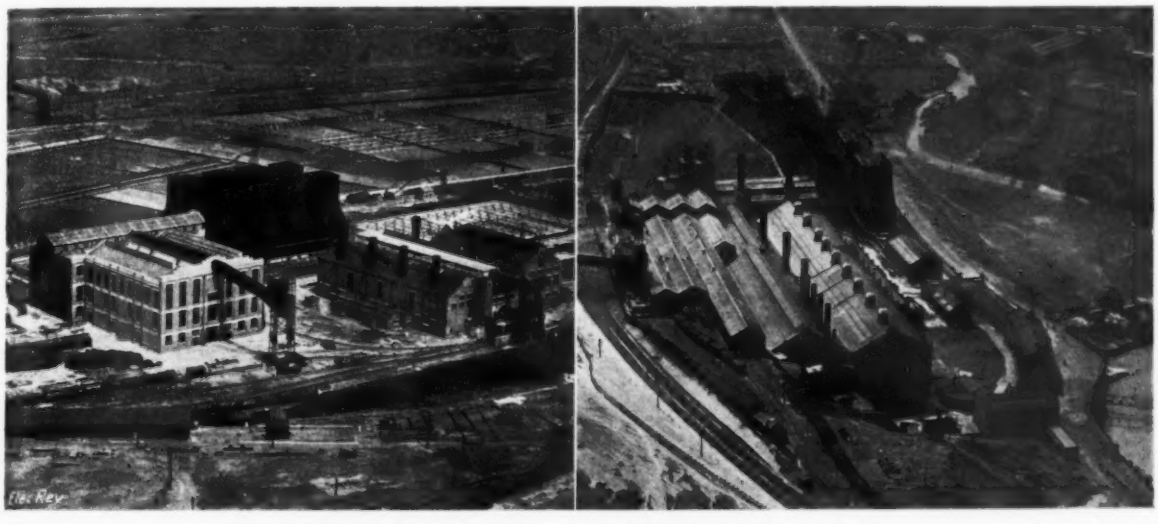
The War Office (Royal Engineer Board) has experimented with the laying of cables by various types of mole-drainer, but the first work of any magnitude carried out by the use of this implement appears to have been the laying of the Cambridge-King's Lynn cable by Post Office engineers in 1932. A standard Ransomes mole-drainer, modified by the provision of wheels at the leading end, was used. A length of 166 yards was laid at a time, the mole-drainer being drawn by a 40-45-h.p. Fordson tractor-winch.

With the Mangnall-Irving thrust-borer the usual length of a "bore" is about 60 ft., but 620 ft. has been accomplished, and by the use of this instrument considerable sums have been saved in the reinstatement of extensive pavings.

Two very interesting machines have been developed in Germany. One is a special type of mole-drainer which forms a strip-steel tube round the cable as it is drawn in. This steel tube is 2 in. in diameter and has a perfectly smooth interior. It can be formed in advance of cabling, but it has been found preferable to draw the cable in at the time of formation.

The other is a complete cable-laying machine which comprises four main parts: an earth excavator, consisting of a chain of endless buckets which deposit the earth on a conveyor, this carrying it to a spout whence it is returned to the trench; and a cable conveyor which carries the cable to the excavated trench just behind the digger from the fourth item, a cable drum trailer, this serving the dual purpose of carrying the cable drum and rolling in the reinstated earth.

In America the Bell Telephone System has evolved a very robust equipment. The cable is laid by a "train" consisting of a "rooter" plough, for cutting and clearing roots and other obstructions; a cable drum trailer, for carrying the cable; a cable-laying plough, which deepens the cut and lays the cable; and a "trench backfiller," for reinstating the earth. The cable is fed from the drum into the 5-in. tube enclosed in the cable-laying plough blade, and thence into the trench. The whole train is very massive and is drawn along by three tractors developing a combined pull of 36,000 lb. Universal couplings allow of tilting when passing over uneven ground.



The two large power stations of the Sheffield Corporation. Left: Blackburn Meadows which was opened by Prince George on April 6th (see p. 533). Right: The Neepsend station

Atmospheric Polution

THE Eighteenth Report of the Investigation of Atmospheric Pollution was issued yesterday by the Department of Scientific and Industrial Research (H.M. Stationery Office, 5s.). Sixty municipalities, three industrial undertakings, and one agricultural institute have taken part in the observations, and during the year ended March 31st, 1932, ninety deposit gauges were in operation. Of the forty-seven stations at which averages were available for the past four or five years, 80 per cent. showed an improvement in tar deposits and 86 per cent. in total deposits. In London the tar deposit at Golden Lane fell from the 7.3 tons per square mile of the previous year to 5.5 tons, but the latter was still nearly three and a half times greater than the average deposit for the last five years, although other components have decreased. The high tar figures are attributed in the report to domestic smoke.

Of the nine London stations three show an increase of tar, three no change, and three a reduction. The maximum annual deposit of tar (22.3 tons per square mile) is found at Ashington, Northumberland, and the minimum (0.36 tons) at Whitley, Dewsbury. Carbonaceous matter other than tar decreased at thirty-three stations; the maximum was 137.16 tons per square mile at Burnley and the minimum 12 tons at Leicester. Mineral dust from road surfaces and ash from chimneys decreased at thirty-six stations and increased at twelve, the maximum (417.6) being again at Ashington and the minimum (20) at Leeds. For total solids forty stations showed a decrease and nine an increase, Ashington heading the list with 738 tons per square mile, while the minimum of 86.6 tons was at Leicester, Western Park.

Deposits of chlorine, probably due to wind-borne sea salt, were lower at forty-two stations. Ammonia was less at thirty-two stations and more or the same at sixteen. Sulphate, another product of the burning of coal, showed a decrease at thirty-five stations and an increase at eleven. The abnormal deposit of sulphates (8.8 tons per square mile) at Ravenscourt Park observed in the previous year (290 per cent. over the previous five years' average) was repeated (8.72 tons); no explanation has yet been found. Smoke-haze was recorded with the automatic filter at thirteen stations, showing that about 2.16 lb. of suspended matter was present per one million cu. yd. on 111 days at Westminster City Hall, forty-two at Westminster Bridge, 141 at Stoke-on-Trent, nineteen at Glasgow, seven at Cardiff, and six at Coventry.

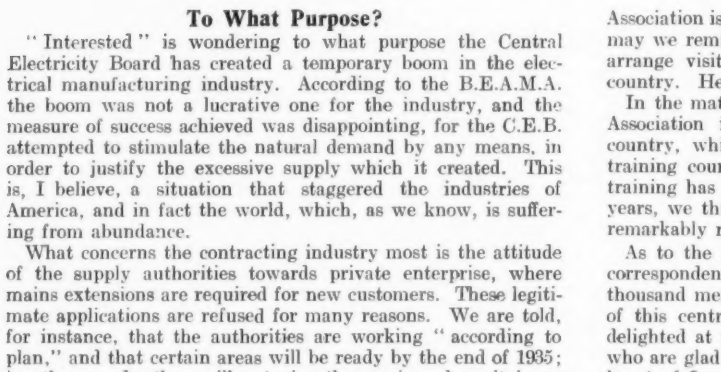
Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

To What Purpose?

"Interested" is wondering to what purpose the Central Electricity Board has created a temporary boom in the electrical manufacturing industry. According to the B.E.A.M.A. the boom was not a lucrative one for the industry, and the measure of success achieved was disappointing, for the C.E.B. attempted to stimulate the natural demand by any means, in order to justify the excessive supply which it created. This is, I believe, a situation that staggered the industries of America, and in fact the world, which, as we know, is suffering from abundance.

What concerns the contracting industry most is the attitude of the supply authorities towards private enterprise, where mains extensions are required for new customers. These legitimate applications are refused for many reasons. We are told, for instance, that the authorities are working "according to plan," and that certain areas will be ready by the end of 1935; in other words, they will not give the service where it is required but where it happens to be convenient to them.



A picturesque view of the new viaduct at Waterford Lane, Southgate, which has been constructed to carry the Piccadilly tube extension to Cockfosters

The following quotation from a letter received will disclose the attitude of the supply authorities:—

"We are protected from unreasonable demands by our right to appeal to the Electricity Commissioners who have power to extend the time in which a supply must be given."

In the circumstances is it fair to accuse private enterprise of lethargy? L. E. Wilson.

Manchester, *April 7th.*

The E.A.W.: Miss Haslett Replies

I was interested in the letter headed "The Electrical Association for Women," and signed "Member," which appeared in your issue of April 7th. I should have thought that "Member's" best procedure would have been to send her criticisms and complaints direct to the committee of her own Association, rather than to make a general and rather confused statement in the Press.

Instead of "wasting time and money on social functions" as your correspondent suggests, the E.A.W. must from time to time arrange these functions in order to raise funds for its work. The fact that they are always very well attended, by branch as well as by London members, would seem to prove that they are valued. We may mention that our forthcoming conference in Birmingham will be attended by members from Lancashire, Yorkshire, and other counties in the north of England, South Wales, Devonshire, East Anglia, and the South Coast.

With regard to the particular function which she mentions, this is a dinner specially arranged for women holding the E.A.W. Diploma to meet together for the first time officially. Obviously the best occasion for such a meeting is during the three-day course arranged by E.D.A., E.L.M.A., and ourselves when many demonstrators are sent up to London by their authorities to attend. The fact that we have already received applications for a large number of tickets is our justification for choosing this date. "Member" believes that the Association is not of any assistance to members outside London; may we remind her that we have thirty-two branches, which arrange visits, lectures, and other meetings throughout the country. Her fare to the nearest branch would *not* be £5.

In the matter of the training of girls as demonstrators, the Association is in touch with training colleges all over the country, which are gradually beginning to establish special training courses outside London. Since this work of special training has only been started in London during the last few years, we think the progress made in this direction has been remarkably rapid.

As to the Association's new headquarters in London, your correspondent possibly does not realise that we have over a thousand members in London who are able to take advantage of this centre, while we have ourselves been surprised and delighted at the large number of members from the branches who are glad to have a pleasant meeting-place available in the heart of London. We are very sorry that "Member" is so placed at the moment that she is unable to take full advantage of the clubroom and its facilities. Does she suggest that we have an itinerant clubroom on the lines of an electrical demonstration caravan?

While we welcome these comments and criticisms from our members, we do hope that in future correspondents will obtain full information of the facts of the case before disapproving of the methods and procedure of the Association. Caroline Haslett,

Director, Electrical Association for Women.

London, S.W.1, *April 7th.*

Canvassers and Canvassing

The communication from "L. H." with reference to mine under the above heading, certainly offers a worthy suggestion as to the usefulness of advice engineers. "Canvasser" is perhaps a misnomer, and often used for want of a better designation. But here again is an example of the tendency of opinion to favour the old-fashioned, because tradition is accepted too readily instead of modified methods to suit the changing order of things. The combination of qualities, as "L. H." points out, is not easily obtained. More often than not it is simpler to strike the happy medium: hence we get the canvasser.

As the present age seems to be one of specialisation, undoubtedly the soundest procedure would be to employ a specialist in each department of electrical utility. The question, "Should salesmen be engineers?" is by now well worn; many opinions have been ventilated and reported in the Electrical Review from time to time. In spite of what the general opinion may be, however, the idea still persists that there are occasions in electrical salesmanship even when it would be advantageous to forget that one is an engineer, and instead remember that one is selling "the most useful service the world produces." It is an attribute of salesmanship to think on the same level as the customer, and an engineer is apt to find this difficult. A. V. Cross.

Walsall, *April 5th.*

Automatic Volume Control

The article by Mr. R. W. Minter in the Electrical Review of March 31st is of interest in view of the probable adoption of automatic volume control by many British set manufacturers. There are several points which, however, need qualification.

The author states that the sensitivity of a set fitted with automatic volume control "changes inversely as the audio output changes." This surely should read "changes inversely as the carrier input changes." It is most undesirable, if true reproduction is to be assured, for the sensitivity to be controlled by the audio output since this would tend to remove all musical expression by reducing loud and raising soft passages to the same level.

I feel that it should be pointed out that one of the disadvantages of automatic volume control, *viz.*, an increase in noise between stations, can be overcome and that there are several methods, known as "quiet a.v.c.," of shutting down the set between carriers.

The diagram in Mr. Minter's article illustrating the basic principles of automatic volume control would have been of far

greater value if the cathodes of valves A and B had been connected to their appropriate points and the cathodes of the screen grid valves had been included.

Finally, I would question the advisability of varying the bias applied to the a.v.c. valve as suggested. The voltage, after adjustment to the value for correct anode bend detection, should be maintained constant. Variation of this bias might easily lead to incorrect detection with consequent rectification of the low-frequency envelope of the carrier. The above-mentioned undesired a.v.c. action on the loud and soft passages of the programme would then occur.

Enfield, *April 4th.* K. R. Sturley, Ph.D.

The "Bakelite" Case

Mr. W. S. Pyrah, whose letter on this matter appeared in your issue of March 31st, cannot be familiar with the Prevention of Corruption Act, so I have ventured to send him a copy. There have been more than a score of cases of betrayal of trade secrets (or of attempts to obtain them), and in some instances imprisonment with hard labour has been imposed. The Act makes it criminal for any agent corruptly to accept, obtain, agree to accept, or attempt to obtain, or for any person to give, agree to give, or offer any gift or consideration to an agent for "doing . . . any act in relation to his principal's affairs or business." By the amending Act of 1916 it became possible to deal summarily with a case within six months of the discovery, not only within six months of the committal, of the offence.

Apart from the Prevention of Corruption Acts there are plenty of precedents on the problems which your correspondent visualised.

R. M. Leonard,
Secretary, Bribery and Secret
London, S.W.1, Commissions Prevention League, Inc.
April 6th.

Automatic Fire Alarms

We were interested to read Mr. J. Scott's letter in your issue of April 7th, but are surprised to note that he was unable to find any installation of fire alarms at the Ideal Home Exhibition. The "Donlarm" automatic fire detector is installed in the Universal Housing Co.'s house as well as in the garage of the *Woman's Journal* House. In producing the "Donlarm" we have made it our objective to combine efficiency with unobtrusiveness, and it would appear that we have carried the latter point too far!

Dealing with the second paragraph of his letter, it may be of interest for you to know that a prominent electrical contractor in the North is contemplating installing the "Donlarm" detector in each of a group of 300 small houses which are now in process of erection.

Donlarm, Ltd.,
London, W.C.2, *April 8th.* L. H. Mackan, *Director.*

The Eastbourne Contracts Case

THE hearing of the charges of bribery and conspiracy at the Eastbourne Police Court against Richard S. Chatfield, an Eastbourne ex-alderman; David W. A. Roberts, formerly deputy electrical engineer to the borough council; the Pirelli-General Cable Works, Ltd.; and Charles McCartney Read, an employé of the company, came to an unexpected conclusion on April 6th, when the defendants withdrew their election to be tried by a jury and pleaded guilty to all accusations except that for conspiracy, whereupon Mr. J. D. Cassels, K.C., for the Public Prosecutor, asked leave to withdraw the charge of conspiracy, and the Bench agreed.

It then remained for counsel to address the Bench in mitigation of the penalties, Mr. Cassels having already asked for 650 guineas costs against the company.

Sir Henry Curtis Bennett, K.C., for the company, said he could not resist this demand, but he asked the Bench to take it into consideration when they came to fix the penalties. It should be remembered, he said, that this was a very large company having a great number of departments and over 3,000 employés. It was a company of very high standing, and it was admitted that its work had been excellent and appreciated. It had not been suggested, and could not be suggested, that the work had been skimped at the expense of the ratepayers. In such a large business there was a danger in the course of years of laxity creeping in. It should not have happened, and he could say now that the whole of the departments had been overhauled and nothing like this could happen again.

With regard to Mr. Read, for whom he also appeared, Sir Henry said he was fifty-seven years old, with three children, and had never had anything against him. He did not stand to gain one penny for himself over the matter. Anything he did was in the interests of the company.

Mr. John Flowers, on behalf of Roberts, said he was forty-nine years of age, married, with one son, aged nineteen. In 1903 defendant got a job with the Eastbourne Electricity Department at 13s. per week. In 1908 he went into business on his own account as a motor and electrical engineer. In 1912 he went to Canada, and in 1915 joined the Canadian forces as a private, served for four and a half years, rose to captain, and was mentioned in dispatches. In 1921 he rejoined the service of the Eastbourne Electricity Department, and in 1929 was appointed deputy borough electrical engineer. He therefore rose from a position of 13s. a week to one of about £600 a year. Until this matter arose he had borne an unblemished character and was a most zealous servant. It was admitted that he was responsible for a tremendous saving in the electricity undertaking. It might have been done by wrong means, but the fact remained that he was most zealous in his object, and saved much money for the ratepayers.

Mr. G. D. Roberts, on behalf of Chatfield, said that his client by his own work, at the age of forty-three, had become one of the leading townsmen. For many years he had been doing work by day as an engine-driver, and devoting his spare time to work for his fellow-citizens. He was elected to the Council in 1921, and in 1927 he became chairman of the Electricity Committee. He threw his heart and soul into the work of furthering the interests of the undertaking. In 1921 the sale of units was about 2,000,000; now it was 24,000,000, and it was the boast of Eastbourne that its electricity was the cheapest in the county. Mr. Chatfield did not make the claim, but it was recognised that he was largely responsible for this. He had pleaded guilty to having the use of a motor car for twenty months and to receiving sums amounting to £40 or £50 for its upkeep. He denied any other charges. He also denied that the interests of the ratepayers had been prejudiced in any way, or that the use of the car had been accepted as an inducement, or that he had acted corruptly. In November last Mr. Chatfield gave evidence before the private inquiry, and all Mr. Wedderburn (who held it) found was that he had acted foolishly because he had failed to realise the dignity of his position as chairman of the Committee.

The Penalties

The chairman of the Bench (Mr. A. Dilloway) said they had considered the question of imprisonment, but had come to the conclusion that justice would be met by the imposition of the maximum fines. The company would have to pay £682 10s. costs and £50 on each of the eleven summonses (£550); Read would be fined £50, or in default three months; D. W. A. Roberts would be fined £50 on each of five counts (£250), in default six months; and Chatfield would be fined £50 on each of five counts (£250), in default six months.

Electricity Supply in East Surrey

THE inquiry into the Draft Order promoted by the London and Home Counties Joint Electricity Authority was resumed on Monday last. It had been adjourned from February 10th (Electrical Review, February 17th), with a view to securing, if possible, agreement between the parties, but no basis for agreement had been reached in the interim. The object of the Draft Order was to secure the transfer to the J.E.A. of the rights of purchase of certain undertakings from the local authorities. The County of London Electric Supply Co. had also submitted a scheme for the co-ordination of transmission and distribution in parts of Surrey. The J.E.A. also made application to the Electricity Commissioners in February, 1932, for consent to purchase by agreement the Caterham and Woldingham undertakings of the Urban Electric Supply Co., Ltd. It was submitted on behalf of the J.E.A. that the Commissioners were not entitled to put the application into competition with the proposals of the County of London Electric Supply Co., Ltd.

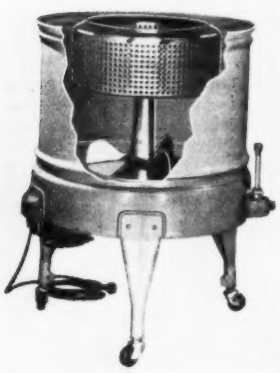
Sir John Brooke (vice-chairman, Electricity Commission), who presided, said that the Commissioners had decided to recommend the withdrawal of the Draft Order, and that they took the view that the consent to the purchase of an undertaking involving a capital expenditure of £170,000 would justify a public inquiry. The J.E.A. then retired from the proceedings.

It was urged, in favour of the confirmation of the purchase agreement regarding Caterham and Woldingham, that it would bring about an immediate reduction in prices to consumers. On behalf of the County of London Co., it was alleged that the Joint Authority had made reductions in its charges without due regard to the effect on trading results, and it was also stated that the County Co. was, in 1931, supplying electricity in areas adjacent to Caterham at less than half the average price charged by the Authority. The inquiry was closed.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Wringerless Washing Machine



A "Thor" washing machine with hydro-extractor

A washing machine fitted with a hydro-extractor for drying is the latest "Thor" product of the Hurley Machine Co. (England), Ltd., 55-59, Oxford Street, W.1.

Clothes are washed by the agitator in the bottom of the tub and transferred to the basket for drying. The tub is porcelain enamelled in two shades of green, and the drying basket is of heavy sheet aluminium.

The machine has a capacity of 5 lb. of dry linen, and stands in a floor space of 24 in. by 25 in. Automatic lubrication is provided for, and the washer is driven by a ¼-h.p. motor.

"Zephyr" Fans

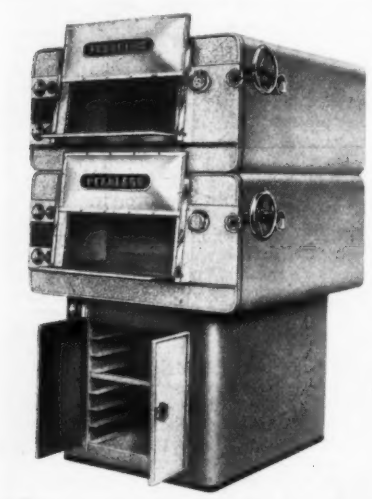
A new range of oscillating fans is now being produced by the Metallic Seamless Tube Co., Ltd., Ludgate Hill, Birmingham. This new "Zephyr" fan is priced at £2 7s. 6d., and can be arranged for wall, ceiling, or desk use. The blades are 8 in. long and the weight is 7¼ lb. Models are available for d.c. or a.c. supplies with a loading of 30 W. A switch on the stand enables the oscillatory movement to be stopped when it is not required.

The "Zephyr" fan

A Confectioners' Portable Oven

A portable oven for confectioners recently marketed by the Peerless Electrical Manufacturing Co., Ltd., Stanhope House, 320/324, Euston Road, N.W.1, can be built up in tiers of self-contained units within any practical limits. As we saw it in the company's showroom the equipment is a double-deck model consisting of two ovens, one above the other, mounted on a proving cabinet. The cabinet could be replaced by a pedestal.

The floor space dimensions are 33 in. by 42 in., the width is 44 in., and the heights to the tops of the first and second decks, respectively, are 52½ in. and 75 in. Top and bottom heating is employed in each oven by two banks of heating elements running from front to back of the oven and contained in steam-tight steel compartments, at the back of the oven metal lining. They are supported along their entire length and operate at "black heat." Each bank is separately three-heat controlled, and there is a pilot light for each bank.



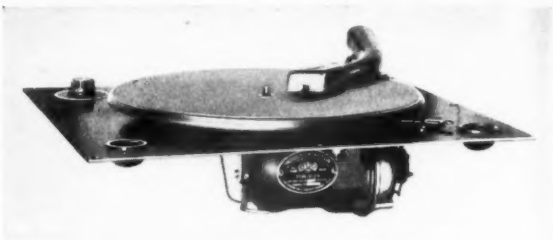
A Peerless double-deck pastry oven and proving cabinet

Through a gear wheel and a toothed rack on the door the latter is opened by a hand wheel at the side in an almost vertical motion, with the result that there is no tendency to draw the heat out of or force cold air into the oven when opening or closing the door. There is also the advantage that the operator's arms cannot normally come into contact with the door. A circular-type thermometer and a hand-wheel controlled vent are additional features.

The actual baking space is 3 ft. by 3 ft. The elements for the proving cabinet, which are designed to maintain a temperature of 212 deg. F., are similarly situated to those in the oven, but at the top only. The cabinet will take seven standard baker's trays.

New Radio-gramophone Units

The Garrard Engineering and Manufacturing Co., Ltd., Newcastle Street, Swindon, is introducing three new radio-gramophone units. The units comprise a motor mounted on a bronzed and lacquered rectangular unit plate, fitted with a pick-up. The universal model (for a.c. or d.c.) costs £6 8s. 6d.; model "202A" (fitted with an induction motor) 81s. 9d., and model "AC4" (also fitted with an induction motor) £3 15s. Pick-up units are now available separately at 32s. 6d.; volume controls cost 5s. extra.



The Garrard "No. 202A" radio-gramophone unit

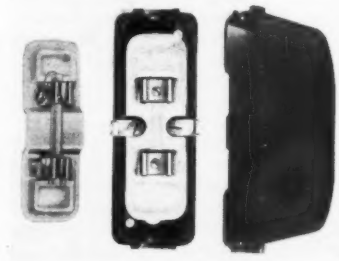
"Self-starting" Electric Cleaners

Automatic starting and stopping by lowering and raising the handle to the cleaning and rest positions, and a power-driven revolving brush are outstanding features of the new "De Luxe Magnet" cleaner, produced by the General Electric Co., Ltd., Magnet House, Kingsway, W.C.2. It costs 15 gns.

The standard attachments to the cleaner, which we examined at the Ideal Home Exhibition, provide for cleaning draperies, cornices, picture rails, and under low furniture, and the machine can be converted into a blower. There is also a floor-polishing attachment, and rotating parts have ball bearings.

The "Magnet De Luxe" vacuum cleaner

A New Insulated Cut-out



The new B.I. cut-out

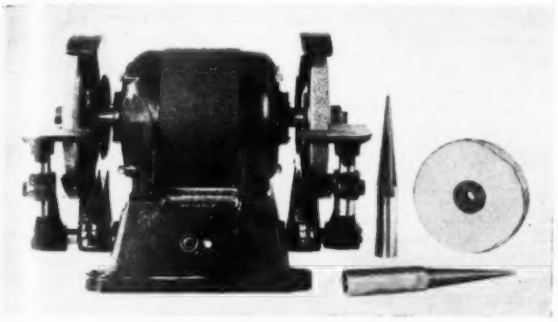
British Insulated Cables, Ltd., Prescot, are now supplying a single-pole 250-V cut-out in 15, 30 and 60-A ratings, enclosed in a non-conductive moulded case. The electrical design is the same as that adopted in their recently introduced ironclad cut-out, and the fuses have been tested with satisfactory results at the National Physical Laboratory. Neutral connectors and sealing chambers in the same moulded material are available for use with the cut-out.

Portable and Bench Grinders

Messrs. S. Wolf & Co., Ltd., 115, Southwark Street, S.E.1. have brought to our notice a new range of portable and bench grinders. Type "WHG.1" is a portable ball-bearing electric hand grinder fitted with a motor for d.c. or a.c. supplies for 25 to 60 cycles and loaded at 190 W (running light). It

is designed for fettling light castings, dressing welded seams and joints and is also suitable for use in the stove manufacturing trade and to constructional engineers. The maximum diameter of the grinding wheel is 4 in. and the spindle revolves at 4,200 r.p.m. when running light. It is priced at £8 15s. and weighs 13 lb.

The Wolf bench and pedestal electric grinder (type WBG.1) embodies a ½ h.p. motor with a speed of approximately

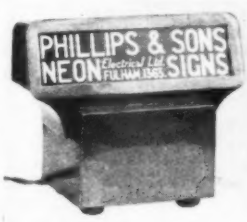


The Wolf type "WBG.1" grinder

2,800 r.p.m. The spindle is of chrome nickel steel ⅝ in. in diameter and mounted on a double row of ball bearings. The armatures of d.c. motors are former wound and the windings are impregnated and stoved. A double pole push-button switch controls the motor. Two grinding wheels are fitted (7 in. by ½ in. and 7 in. by ¾ in.) and the price is £13 10s., with motor windings for d.c. up to 440 V, single-phase, 50 cycles, up to 240 V, or three-phase, 50 cycles up to 440 V. Fitted with a floor pedestal it costs £3 more.

A Neon Box Sign

A new type of sign just put on the market by MESSRS. PHILLIPS & SONS ELECTRICAL, LTD., 40, Waterford Road, Walham Green, S.W.6, incorporates an interchangeable illuminated stencil, the lighting medium being neon tubes. These are arranged compactly at the back of the stencil, this giving a uniform and brilliant effect.

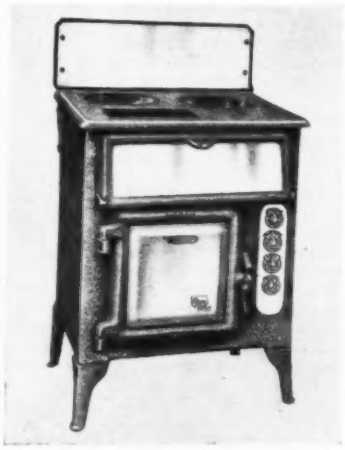


The new Phillips sign

The casing is of copper and can be supplied in copper bronze, oxidised copper, frosted black, or any special finish. The transformer can be wound to suit any voltage between 100 and 250 V a.c., and is housed in the base together with the associated small parts. A flexible lead with a three-pin plug is provided. The running costs are extremely low.

Revo Cookers

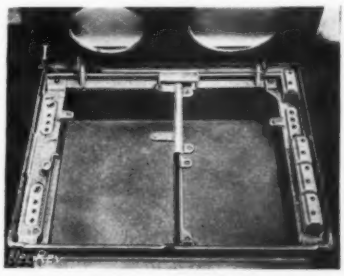
A new Revo cooker, the "No. 50," departs somewhat from the usual Revo practice in that the switch frame is incorporated in the body. The hot cupboard extends the full width of the cooker and provides ample space for plate warming, while an unusually light boiling plate carrying frame with a single easily detachable centre bar is incorporated. The boiling plates each have a lifting handle to ensure a straight pull when they are being removed, and are loaded at 2,000 W and 1,600 W respectively. A 2,500-W grill-boiler is also included, and all elements are controlled by separate three-heat switches. The fuses are situated directly under the hob and are readily accessible. The measurements of the cooker are 28 in. wide by 22 in. deep by 37 in., with an oven 15 in. by 16¼ in. by 17¾ in., heated by plug-in elements in the sides and bottom. The size of the hot cupboard is 22 in. by 21 in. by 5½ in.



The new Revo cooker and boiling table

"Chromalox" or "Revo Superspeed" elements are fitted. The price is £16. Extras available are: "De luxe" finish, £1; thermometer, 10s.; low splash-plate, 10s.; high splash-plate with a plate rack, 25s.

The same type of hob construction is being used for the No. 20 and 30 as well as the No. 50. The sockets for the boiling plate plug-in pins are situated in the side frames of the cooker, and the only other member necessary for the support of the hotplates and grill boiler is one removable bar reaching from front to back of the cooker. This centre bar is easily detached, leaving the hotcupboard entirely clear for cleaning.



The new Revo hob

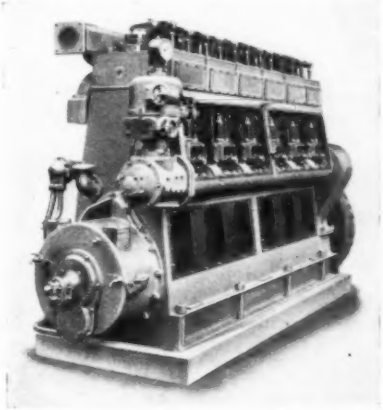
The supporting studs for the boiling plate carriers can easily be adjusted with the complete hob in position. The boiling plate undercarriage is all vitreous enamelled in mottled grey and does not chip, crack, peel or stain, and the boiling plate carriers themselves are vitreous enamelled grey, and are easily kept clean.

In this new series of cookers the complete hob can be dismantled and replaced in a matter of seconds.

Another new development by the same company is a boiling table with an oval surround, enabling two utensils to be accommodated on the boiling plate at the same time. A "Chromalox" hot-plate housed in cast-iron is incorporated, and the three-heat switch is protected from spilled liquids by a special lip which leads the liquids away. The finish is mottled vitreous enamel, and three sizes are available, with loadings of 1,200, 1,550, and 1,750 W, and boiling plates of 7½, 8, or 8½ in. diameters; the prices are £2 7s. 6d., £2 10s., and £2 12s. 6d. respectively.

Totally Enclosed Diesel Engines

The ENGLISH ELECTRIC CO., LTD., Stafford, has developed a new line of mechanical-injection, cold-starting, four-stroke, totally enclosed Diesel engines.

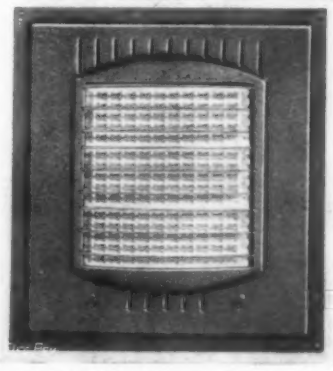


The new English Electric Diesel engine

Type "K" engine is standardised in units with from three to eight cylinders, each giving an output of 50 h.p. at 600 r.p.m. Each cylinder has its own British Bosch pump and atomiser; fuel delivery by each pump is controlled by a governor fitted with ball bearings throughout. Forced positive lubrication is furnished by a geared pump driven from the crankshaft. The valve seats have separate cages. The engine can be shipped as a complete unit, only the flywheel and minor parts being packed separately.

Magnet "Inset" Fires

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has introduced a range of new "Magnet" fires of the inset type finished in vitreous coloured enamel and chromium plate. They are particularly suitable in houses where economy of space, combined with maximum efficiency and low cost, are essential.



The 3-kW "Magnet" inset fire

Double-pole switches are fitted so that the wiring can be directly connected without the addition of any external switch. The switches, wiring and elements are enclosed in a metal box at the back of the fire, and special reflector plates are fitted therein so as to throw the maximum heat forward, and thereby keep the temperature of the back within safe limits; this is a most important provision when fires are fitted to coke breeze walls. A current of hot

air is circulated through the opening in the front casing. The prices are as follows: 1 kW, 30s.; 2 kW, 46s.; 3 kW, 62s. 6d., in coloured vitreous enamel; chromium plate finish costs from 9s. 6d. to 17s. 6d. extra.

The new "Hotpoint Junior" vacuum cleaner

An Improved Vacuum Cleaner

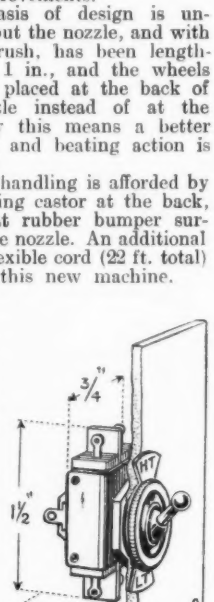
The latest development of the HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, Oxford Street, W.1, is a new "Hotpoint Junior" vacuum cleaner, which, although selling at the same price (£10 17s. 6d.) as the previous model which it supersedes, has been provided with many important improvements.

The basis of design is unaltered, but the nozzle, and with it the brush, has been lengthened by 1 in., and the wheels are now placed at the back of the nozzle instead of at the sides; by this means a better sweeping and beating action is obtained.

Easier handling is afforded by a swivelling castor at the back, and a fat rubber bumper surrounds the nozzle. An additional 4 ft. of flexible cord (22 ft. total) increases the radius of operation of this new machine.

A Neat Double-pole Switch

We have recently examined a specimen of a new 1-A. 250-V toggle action, double-pole, double-throw switch of extraordinarily small dimensions. It embodies a q.m. and b. action and is very suitable for mains radio sets where it can be used to control both supply poles or one pole of the l.t. circuit and one pole of the mains in the case of receivers employing h.t. eliminators. The insulation resistance is between 50 and 70 megohms. The switch, which is made by MESSRS. A. F. BULGIN & CO., LTD., Abbey Road, Barking, is very neat in appearance and, costing only 2s. 3d., should have a wide appeal.



The new Bulgin d.p. switch

A Lighting Development

Forty per cent. reduction in current consumption is claimed by N. L. REFLECTORS, LTD., Abbey House, 2, Victoria Street, London, S.W.1, to result from the use of their new specially designed reflectors. The principle of the invention lies in the theory that there is too much orange and yellow in ordinary artificial lighting, and in filtering the correct proportion of these colours out.

The reflector consists of several layers of white crystal glass on the inside, backed by a very fine layer of blue coloured filter-glass which is in turn backed by a fine layer of silver

Selections from the ranges of the N.L. reflectors and fittings

and finally by galvanically deposited copper treated with lacquer as protection against mechanical abrasion. The resulting light is a mixture of direct unfiltered rays and indirect filtered rays in the light-cone. The new type of filter in conjunction with the mirror reflector ensures that only a portion of the rays is filtered.

The principle is applied to a comprehensive range of fittings embracing industrial and domestic equipment, shop-window reflectors, colour-matching units, pendant and wall fittings, and specially designed doctors' and dentists' apparatus. The colour-matching lamp shown (1) is chromium plated, measures 11 in. at the base, and has provision for focusing, and costs 3 gns. complete with the lampholder. No. 2 is a "Bakelite" sewing-machine fitting complete with switch, lead and connector for 19s. 6d. No. 3 is the "Trent Baker," one of a range of enclosed pendants (coloured "Bakelite" and chromium plate, 35s.); while the "Midget" (4) and "Loaf" (7) are two of a range of reflectors designed for light concentration. The "Balloon" (5), 12 in. diameter and 36 in. standard overall length, costs 37s. 6d.; No. 6 is a shop-window unit and No. 8 a desk lamp.

Small Universal Motors

A new range of small motors, together with a sewing machine motor with a needle lighting attachment, has just been put on the market by the DISPLAY MOTOR AND ACCESSORIES CO., LTD., 94, Charlotte Street, London, W.1.

There are three types of small motors. Type "B.1," priced at £2 5s., is available as a 1/50-h.p. model, with a speed of 2,500 r.p.m., or 1/25-h.p. with a speed of 3,500 r.p.m. The width is 2½ in., and the length 4½ in., with a ⅜ in. shaft extension on either side. The bearings are felt packed, requiring very little oiling, and are spherically seated and self-aligning. This type can be supplied with a ball thrust at the non-driving end for vertical working. Known as type "B.G.1," the motor is available at £3, with a single reduction gear with a ratio of 25:1, 50:1, or 100:1. A double reduction gear box can also be supplied at £3 12s.

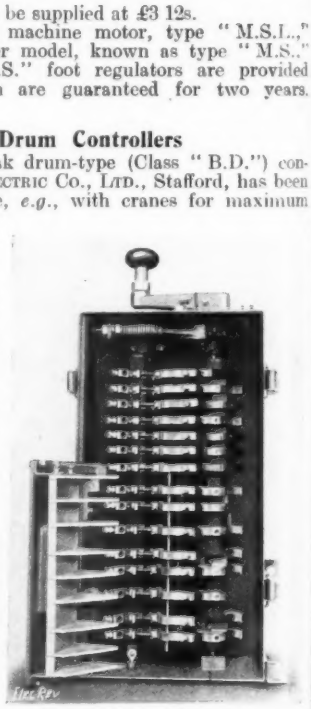
A new type of sewing machine motor with needle lighting attachment and a foot control

The new ¼-h.p. sewing machine motor, type "M.S.L.," costs £4 8s., while another model, known as type "M.S.," costs £3 15s. Type "R.S." foot regulators are provided with both models, which are guaranteed for two years.

Air-break Drum Controllers

The new line of air-break drum-type (Class "B.D.") controllers of the ENGLISH ELECTRIC CO., LTD., Stafford, has been designed for rough service, *e.g.*, with cranes for maximum currents of 120 and 80 A in intermittent or continuous service, respectively.

The controllers are enclosed in a welded steel case with a packed joint between the case and its cover, which is held in position by snap catches. The diameter of the drum is 4 in. on the smaller size and 5 in. on the larger; the ¼-in. h.d. copper contacts are carried by c.i. segments on an insulated square shaft. The drum can be withdrawn by removing four screws in the top plate without disturbing the fingers or connections. The hinged contact fingers are fixed to the finger bars by diagonal clamps and can be withdrawn by the removal of two screws; they are easily adjusted to compensate for wear. Controllers for d.c. motors are fitted with magnetic blow-outs, which, together with the rectangular arc shields, are arranged to swing outwards to give access to the drum and fingers. A device can be fitted to the handle to prevent its being moved from "forward" to "reverse" without a pause in the "off" position.



The type "BD" drum controller

The "Prestcold" Refrigerator

In our issue of March 31st we stated that the "Prestcold" refrigerator had "a spacious foot-controlled ventilated dry storage bin." This should have read "a foot-controlled door and a spacious ventilated dry-storage bin."

Progress in the Northmet Area

At the annual meeting of the North Metropolitan Electric Power Supply Company in February Lord Ashfield reviewed the progress that had been made during the year 1932 throughout the company's extensive and developing area. Some idea of the manifold and varied activities that have been occupying the attention of Captain J. M. Donaldson, the chief engineer, and his large organisation with its twenty fixed and two travelling showrooms, will be obtained from the following notes:—

Wood Green

Since the Wood Green Electric Lighting Order was taken over from the Tottenham and District Gas Co. on January 1st the Northmet Company has been busily engaged getting matters both technical and commercial on to its standard lines introducing the standard two-part tariff, which is very much appreciated, and making plans for shortly changing over the d.c. part of the network to a.c. A showroom in the Muswell Hill district, near Alexandra Palace, which was opened on February 15th, has a very good demonstration kitchen at the back and this has been fully utilised. A large four-storey showroom and offices will be erected on land which has been secured almost in the centre of Wood Green, not very far from the new electric railway station; for immediate purposes a small temporary building is being used as an auxiliary showroom and inquiry office. Other arrangements, however, are in hand for a large display near this point pending the completion of the new building.

St. Albans

St. Albans will shortly be added to the number of towns where the street lighting is entirely electrical. The gas company has held the contract—and incidentally given very good service—for many years. At the end of last year, however, the Northmet Company put in a tender at the same time as the gas company for lighting the whole of the district, although this meant laying new mains in a considerable number of streets where no supply was available. The Council decided to accept this tender, involving at the present time a total of 738 lamps. The gas company's contract did not expire until March 31st, and, therefore, the work has only just been started and will not be completed probably for another two months.

A very bitter correspondence appeared in the local Press from the gas company and its adherents, and the point was made that so much less coal would be carbonised in St. Albans (or more likely Watford since most of the gas is made there), that this would deprive the railway companies of traffic and the local inhabitants of work and that the results would be reflected in the cost of gas. The case of Westminster was produced, as it so often is on such occasions. It might almost be the only gas lighting job in London!

March

While on the subject of gas conversions we may refer to activities in the Bedfordshire, Cambridgeshire and Huntingdonshire area, which is managed by the Northmet Co. March is in the north of Cambridgeshire. It is quite a large town and is largely inhabited by railwaymen as there is a large junction there. The B.C. & H. Company originally tendered for about twenty lamps in the main streets of the town and this tender was accepted. The gas company then expressed its intention of putting up the price for the remainder of the lamps and the Council therefore asked the Northmet to quote for the whole of the district. This again meant cabling additional streets as the supply in March has not long been started and it is not very well developed. The company, however, did this and obtained the contract for the whole of the street lighting, numbering in all 235 lamps, making another town entirely electrically lighted.

Here again interesting correspondence took place, it being contended by the gas side that the lamps which the electricity company were going to put up would not be as good as the gas lamps. The general opinion of the inhabitants is that the lighting is very much better than it was.

Newmarket

This town is also in the area of the B.C. & H. Co., or rather the Newmarket Company has been purchased by the B.C. & H. Co. Here, too, gas has been enthroned for many years, although the electricity company had some dozen or so lamps up for a short time. There was an open competition for the lighting of the whole of the town, and the B.C. & H. Co. was successful, the number of lamps involved in this case being 243. Many columns in the local newspapers were filled with the diatribes of the gas company. Westminster was introduced again and the local carbonisation of coal was also stressed. It is difficult to see what the gas authorities expect to get by such correspondence; they certainly have gained nothing in the cases mentioned above.

Public Lighting from Tramway Span Wires

It is a very common and very natural practice to make use of tramway posts for supporting lamps, whether gas or electric, and there is generally some provision made by local authorities enabling the companies to do this as a right. The original span wire lighting system put up by the Northmet some twenty years ago was in Green Lanes, Southgate. For the whole length of this main thoroughfare in this district—a total of 2¼ miles—there were two lamps per span, one of which was put out at midnight, and from time to time the size of the lamps has been increased. A contract has now been secured to replace the existing lamps by 200-W gasfilled lamps.

In the neighbouring district of Tottenham the main road lighting has always been electric, *i.e.*, along Seven Sisters Road, the High Road through the full extent of the district, Green Lanes and Lordship Lane. Originally flame arc lamps were used and these were displaced, first of all by vacuum lamps of similar wattage, and eventually by gasfilled lamps. These, however, were mounted for the most part on brackets on the top of the tramway poles. Seven Sisters Road and Green Lanes have now been converted to span wire lighting—two 200-W units per span, and the same system has been carried through the whole of Edmonton. The entire length of the High Road is now being similarly converted with two 300-W units per span. In these three districts there are nine miles of street electrically lighted by the span wire method, a total of 809 lamps being employed.

On the western side of the district there exists in Wembley a total of 2¼ miles of street and 116 lamps, while in Edgware there is one mile of street and 96 lamps. In East Barnet and on Barnet Hill, that part of the Great North Road which passes through these districts is also lighted by the span wire method, but in a different way, Revo directional fittings being placed on the span wires and arranged so that the majority of the light is thrown longitudinally. The distance is just over one mile, involving forty-seven lamps.

Recent Doings in Lancashire

We have recently recorded in the Electrical Review facts showing the general trend of work proceeded with by the Lancashire Electric Power Company (of which Mr. C. D. Taite, M.I.E.E., is the engineer and manager) during a year of considerable fluctuation in the state of the textile and other industries. Special significance attaches to the large capital expenditure upon distribution preparations for the purpose of opening up a number of new districts largely rural in character, and it will be interesting to particularise some of the operations that are now in progress to educate the public electrically so that the demand for all classes of supply may be constantly increasing.

Electrical exhibitions which the company is holding in small towns and rural districts throughout the area are proving very effective as a means for bringing vividly before the public the many ways in which electricity can be of service in the home and on the farm. During March three-day exhibitions were held at Hoghton, Withnell, Burscough, and Haydock. Announced well beforehand in the local Press and on prominent hoardings throughout the surrounding districts, the demonstrations of electric cooking, cleaning, and washing drew good attendances and satisfactory business was obtained.

A special feature arranged at each place was the display of farm and poultry farming machines, electrical incubators and brooders. Invitations were sent to the headmasters of the local schools and the senior classes attended special sessions provided for them. Keen interest was taken in the demonstrations and brief addresses delivered on electricity and its uses. The exhibition at Haydock was the first of its kind ever held in the town and the crowded attendances, particularly in the evenings, were most encouraging.

For the purpose of supplementing such exhibitions and opening up new areas the company is to purchase, in conjunction with the Preston Corporation, a travelling showroom. This will soon be on the road. At the company's Chorley branch cooking demonstrations, supported by a Press campaign, have proved so popular that at present they are being held twice a week instead of on the weekly market-day as in the past.

Turning to the industrial side of the company's activities, the Manchester-Bury electrified lines of the London, Midland and Scottish Railway have for a month now been taking their supply from the Lancashire Electric Power Company under the contract entered into towards the end of last year. The supply is being given from the busbars of the Radcliffe station past which the railway company's feeders are laid. The railway company's supply station at Clifton is being closed down as it will no longer be required in view of the new arrangement with the Lancashire Company.

New Books

Electrical Technology, 2nd Edition, by H. COTTON. Pp. 468. London: Sir Isaac Pitman & Sons, Ltd. Price: 12s. 6d.

The well deserved success of this book has resulted in the appearance of another edition, but so much new material has been added that it might be described as a new work. Practically the whole field of electro-technology is now covered, and in a way which should appeal both to students reading for examinations and to many practical engineers. It has been the definite intention of the author to make this work the text book for the examinations for National Certificates, certificates of the City and Guilds of London Institute, the graduateship examination of the I.E.E., and the engineering degrees of London and other universities.

The more elementary portions of the subject are not touched upon. The work begins with the magnetic circuit and measurements, inductance and the properties of inductive d.c. Direct-current machinery is introduced by a chapter on construction which comprises a description of mechanical details, examples of the principal types of winding and the deduction of the e.m.f. equation. The attention of students is directed to the way in which this equation is derived; in many text books and in consequent teaching the proof is wrongly presented. About one-third of the book is devoted to d.c. working. Illumination, electrolysis, and accumulators are treated briefly.

The fundamental principles of a.c. circuits are adequately explained and illustrated with vector diagrams, and worked numerical examples. An exposition of the symbolic method applied to the calculation of a.c. circuits is presented as early as possible, and greatly simplifies such calculations as those of the parallel operation of transformers and unbalanced three-phase loads. Transformers are treated in very satisfactory fashion; practically every aspect of their working is touched upon.

A great attraction is the number of worked examples in the text, while a selection of questions chiefly drawn from examination papers set by the London University and the City and Guilds of London Institute is given at the end of most of the chapters, but some of these might have been replaced by more recent examples.

Thermodynamics applied to Heat Engines, by E. H. LEWITT. Pp. 347; figs. 108. London: Sir Isaac Pitman & Sons. Price: 12s. 6d.

This latest addition to Pitman's "Engineering Degree Series" maintains the high standard set by the earlier books in the series, but is perhaps even more to be welcomed because its subject has hitherto hardly received the attention that it merits. In the B.Sc. syllabus of the London University the subject of "applied thermodynamics" seems to many authorities to incline rather too much to the academic side, with the result that while a student may have a thorough working knowledge of the theories underlying the design of steam turbines, internal-combustion engines, &c., he is still very far from being able to pass the examination.

In this book the author has endeavoured to remedy this defect by linking up the fundamental laws of thermodynamics with the design and operation of the different practical forms of heat engine. The treatment cannot be other than highly mathematical, and in the first chapter the reader finds himself called upon to exercise his knowledge of the calculus, but, granted this preliminary equipment, it must be admitted that the author succeeds in dealing logically and in not too difficult a manner with what is essentially a mathematical subject. The laws of the expansion of gases are treated both for constant and variable specific heats, while in the theory of the steam-engine cycle the effect of reheating and bleeding are treated.

In the sections on the internal-combustion engine we should like to have seen some suggestion of the possibilities of the compound internal-combustion engine and the internal-combustion turbine, both of these being within the bounds of future development. The worked-out numerical examples and the questions (with answers) at the end of each chapter add considerably to its value. To the engineer studying for his degree or for the associate membership examination of his institution this book can be recommended with confidence.

Conduction of Electricity through Gases, by SIR J. J. THOMSON and G. P. THOMSON. Cambridge: The University Press. Price: 30s.

Thirty years ago, when the first edition of this work was published, the whole subject was dealt with in a very modest little volume, and, although the discharge of electricity through gases was of great interest to the physicist, comparatively few engineers realised the future importance of the work. Since then the engineering significance has been realised, and the commercial development of apparatus in which the phenomena play an important part is one of the features of modern electrical progress.

This great development is in no small measure due to the splendid work of Sir Joseph Thomson himself. The book constitutes a masterly and comprehensive résumé of this great mass of research, including the properties of cathode rays, the collisions of electrons with gas molecules, ionisation by positive ions, reflected and secondary electrons from solids, ionisation by X-rays, and ionisation by chemical action, the bubbling of air through water and the splashing of drops. The complicated phenomena associated with the discharge of electricity through gases at low pressure is comprehensively dealt with in a chapter divided into twelve sections. Chapters on spark discharge and the electric arc conclude the volume.

Throughout the work there are copious references to original papers and articles bearing on the subjects under discussion, so that the work is an invaluable book of reference as well as a lucid and authoritative treatise by masters of the subject.

Alternating Current Electrical Engineering, by PHILIP KEMP. Pp. 595; figs. 418. London: Macmillan & Co., Ltd. Price: 15s.

The tendency towards the standardisation of a.c. and the elimination of the d.c. system of supply has made it essential that every electrical engineer should obtain at least a working knowledge of the theory and practice of a.c. engineering. This calls for a knowledge of mathematics to the extent usually reached in the secondary school. Algebra, including at least the elements of differential and integral calculus, is essential, and so also is some trigonometry.

Kemp's book—which first appeared in 1918—can claim to give a working knowledge of the theory and practice of a.c. engineering with the inclusion of the minimum of mathematics (perhaps that is why it is beloved of students!), but it is significant that the author should make a plea for a higher standard of mathematical attainment than is commonly met with. In this, the fourth, edition the opportunity has been taken to expand the work in order to include many of the more important of the latest developments. Thus the mercury-arc rectifier and the thermionic valve are dealt with, although we would like to see this part of the subject treated at greater length in view of its rapidly growing importance. An entirely new chapter has, however, been added on the oscillatory circuit.

A First Year Engineering Drawing, by A. C. PARKINSON. Pp. 165; figs. 264. London: Sir Isaac Pitman & Sons. Price: 5s. net.

In the author's opinion (according to the preface), the scope and standard of this book have been arranged to meet the requirements in machine drawing of the first-year courses in the National Certificates in Mechanical and Electrical Engineering. But although the book is intended for electrical as well as mechanical engineers it contains no examples of electrical practice. A first-year course in machine drawing should include parts of electrical machines and switchgear.

Our impression of this book is that too much matter has been crammed into it, and that little discrimination has been exercised in selecting the examples. What the present-day engineering student requires is an acquaintance with *modern* practice and ideas. Old-fashioned plumber blocks, bearings, lubricators, and engine parts are only of interest historically, and should not be given as examples for machine drawing.

No drawing examples are given of modern ring-lubricated bearings or of ball bearings, and the only example of the latter is in a sketch of a loose pulley! It is a waste of time and effort for a student to draw the examples given as exercises in the section on bearings (pp. 78-90).

We would suggest that in future editions at least half of the present items of Part II, which covers such things as fastenings, couplings, bearings and pivoted joints, should be replaced by drawings representative of modern practice.

Light and Power on Farms, by W. H. JONES. Pp. 22. Department of Agricultural Economics, University College of Wales, Aberystwyth. Price: 6d.

This little book is a practical study of the use of electricity on some farms in South Wales, and is intended primarily for farmers and others interested in rural electrification. The guiding theme is that low cost and extended use are mutually dependent, but the farmers are not likely to derive any considerable advantage from electricity until they are fully acquainted with its possibilities as well as with its actual costs. Some useful examples are given of farms in the areas of the South Wales Power Co. and the S.W. and S. Power Co. and the book should be obtained by all requiring information on the subject.

* * *

Shorter Notices

"Modern Motor Repairs" is the title of a work which is being issued by Messrs. George Newnes, Ltd., in twenty-four weekly parts (1s. each). Among the matters dealt with in the first part is "Electrical Trouble Tracing," useful information on the lighting, charging, and starting circuits of modern cars being provided.

"Handbook to the Factory Acts and Truck Acts," by J. Owner. Pp. 120. London: Sir Isaac Pitman. Price: 3s. 6d. This book is a useful guide in such simple language that no legal knowledge is necessary. The author was at one time a member of the factory inspection staff of the Home Office.

Volume VII of the journal of the Electrodepositors' Technical Society (Pp. 194) is now available at 15s. (non-members) and contains reports of papers and discussions during the last year.

"The Parish Pump," by C. Kent Wright. Pp. 55. London: Ivor Nicholson & Watson. Price: 1s. A booklet on local government.

In the Courts

IN the Chancery Division on April 5th, Mr. Justice Luxmoore had before him a motion on behalf of Mr. James Tankard, the holder of debentures for £1,250 and £500 respectively, for an order for accounts and inquiries in an action against the Ingleton Electric Lighting & Power Co., Ltd., and other defendants who were holders of other debentures.

Mr. C. W. Turner stated that the repayment of the debentures was long overdue and a receiver was appointed in February last. Negotiations had taken place with a view to the acquisition of the company by Crompton Parkinson, Ltd., or by a company formed by them for the purpose of the undertaking. It was at the suggestion of the Electricity Commissioners that the receiver had been appointed with a view to facilitating the carrying out of the sale.

There was no opposition to the motion and his Lordship made the usual order.

Judgment in the Radiovisor Appeal

The Court of Appeal, consisting of Lords Justices Scrutton, Greer and Slesser, delivered judgment on Monday last in the appeal by Radiovisor Foreign & Colonial, Ltd., from the judgment of Mr. Justice Lawrence in the King's Bench Division dismissing an action which the company brought against Radiovisor Parent, Ltd., claiming £200,000 damages and the return of 100,000 £1 shares. The claim was based on fraud and misrepresentation when the defendants, the Parent Company, sold the appellants the foreign rights in a selenium light bridge. The Parent Company denied both fraud, misrepresentation and damage.

Mr. Justice Lawrence, after a forty-three days' trial, gave judgment for the Parent Company, and held that the allegations against them of fraud and misrepresentation had not been made out and that in his opinion the invention was "a novelty, technically, and a marvellous one." The arguments on the appeal extended to twenty-seven days, at the conclusion of which the Lords Justices reserved their judgments.

Lord Justice Scrutton, in the course of a long written judgment, said that the appellants seemed to have taken upon themselves a very serious burden. Mr. Justice Lawrence had said that he had "found that there was no fraud upon any view." He found that everyone, including Mr. Neale and Mr. Clutterbuck, believed in the bridge in December, 1928, the relevant date of the alleged misrepresentation, and that there was no fraud in making the representation as to constancy of resistance. The judge had seen Mr. Clutterbuck and the other witnesses and the Court of Appeal had not. At the same time the judge had rejected the evidence of Mr. Terrell, a promoter, and one of the principal witnesses for the plaintiffs. He (the Lord Justice) had carefully read the evidence of Mr. Terrell and without having seen him had formed the same opinion as the judge.

In the present case a great deal more was now known about selenium in its commercial aspect in 1932 than was known in 1928, and the tendency of the appellants' arguments was to assume that what was known in 1932 should be taken to have been known in 1928. The plaintiffs had failed to satisfy him that he ought to find that Messrs. Neale and Clutterbuck did not honestly believe in the statements complained of.

The Lord Justice said he was satisfied that the views which were entertained in 1928 that the bridge would work if properly developed were honest beliefs and not fraudulent misstatements. With regard to the alleged representation that the bridge could be made with any reasonable degree of sensitivity, he could not interfere with the finding of the judge refusing to find fraud in respect of that ambiguous statement.

The Judge had found that there was no fraud in the making of the representation as to the constancy of resistance. The appellants had not satisfied him that he ought to interfere with the Judge's finding in that respect in a case of fraud. Considering all the evidence he would have come to the same conclusion as the Judge had come to. He accordingly dismissed the appeal with costs

Lords Justices Greer and Slesser also delivered judgments to the same effect, and the appeal was accordingly dismissed with costs.

Mr. Winston Churchill Claims Trade Discount

Appearing for Mr. Winston Churchill at Westminster County Court on April 6th, Mr. P. Pitt, barrister, submitted particulars of defence to the claim for £22 14s. 5d. balance of an account by Messrs. Jackson & Boyle, Ltd., Berners Street, W. A week ago, when Mr. Pitt applied for reference of the dispute to an assessor, Judge Dumas ordered that full particulars of defence should be delivered in writing (see our last issue, page 496).

Mr. Churchill had paid £200 on the account for electrical wiring in his flat in Morpeth Mansions, Victoria, and the defence at first put in stated that he was advised by his architect and surveyor, Mr. C. J. Goodwin, that he was entitled to the sum claimed, which represented twenty-five per cent. of the account. The plaintiff firm refused to allow this, saying it was a trade discount, and to allow it to Mr. Churchill would be treating him as a wholesaler.

Mr. A. E. Beecroft, barrister, for Jackson & Boyle, Ltd., objected that the particulars now supplied were incomplete, and did not deal with what was complained of in the work. On the occasion of the previous application, said Mr. Beecroft, it appeared to be a dispute between electrical engineers and an ordinary architect, whereas as a matter of fact it was nothing of the sort, because Mr. Churchill's architect was a civil servant on the staff of H.M. Office of Works. No details at all were given of disputed items.

Judge Dumas told Mr. Pitt that he was touching Mr. Beecroft's clients in a very tender spot. They were entitled not to have allegations that their work and material were faulty, bad and excessive in price, without having full particulars of it, and those particulars had to be in writing. He therefore ordered that full particulars of the defence should be filed in writing by April 19th. The architect, whose opinion had to be supported, and in defence of whom the defendant was fighting the action, should have no difficulty whatever in writing out the kind of document which he thought the defence ought to file. The motion to refer the matter to an assessor would be dismissed with costs.

The Opening of Sheffield's New Station

THE Blackburn Meadows power station of the Sheffield Corporation (which was described in our issue of March 24th) was officially opened by H.R.H. Prince George on Thursday last.

Following the brief ceremonial, Councillor John Green (chairman of the Electric Supply Committee) presented the royal visitor with a stainless-steel pocket-knife suitably etched and inscribed. Later Prince George made a tour of inspection of the power station, and congratulated Councillor Green and Mr. Ernest Morgan (the general manager) on the admirable arrangements made, and the general lay-out of the station.

Speeches at the luncheon held at the Royal Victoria Station Hotel, prior to the station being opened, were brief. The Lord Mayor of Sheffield (Alderman Ernest Wilson) presided. Councillor Green referred to the opening of the first generating station at Blackburn Meadows by the Duke of York twelve years ago and said the station was still giving good national service. The Sheffield electricity undertaking was one of the largest and oldest in this country, having been in active operation for over forty years. The station was a valuable contribution to the national grid scheme, and he could only hope that its performance would equal, or even surpass, the expectations of those concerned. Mr. Morgan had been in Sheffield for four years, but Mr. S. E. Fedden, now area manager of the Central Electricity Board, had taken a part in the erection of the station.

His Royal Highness said that the purposes for which electricity could be used were always increasing. To help to secure prosperity, the great new power station would be able to meet present and future demands. Electricity would be sold at an economic rate, an essential factor if products were to be produced on a competitive basis, and if it was to be available for the many labour-saving devices which relieved the drudgery of household duties.

Sir Andrew Duncan (chairman of the Central Electricity Board) proposed the toast of "The City of Sheffield," stating that the Sheffield undertaking was the fifth largest municipal one in the country, and its average price per kWh for all usages was the lowest. For lighting the price was the lowest, and for power the lowest equal with another undertaking. The city was aiming at being the lowest without equal. In face of such a record, he would like to overlook the fact that Sheffield had no central showroom, but he hoped that it would not remain much longer without one. The Lord Mayor responded to the toast.

Among those present at the luncheon were Sir Archibald Page, Mr. Ernest Morgan and Mrs. Morgan, Sir John Brooke, the Bishop of Sheffield and Mrs. Burrows, the Master and Mistress Cutler (Col. and Mrs. A. N. Lee), Provost A. C. E. Jarvis and Mrs. Jarvis, Sir Charles Clifford, Sir Harry Haward, Sir Holberry Mensforth, Mr. W. B. Pickering (president, Sheffield Chamber of Commerce), Mr. A. C. Cramb (director of the British Electrical Development Association), Mr. G. Porter (president of the Incorporated Municipal Electrical Association), and Mr. S. E. Fedden (area manager to the Central Electricity Board).

Licensed Engineers in the U.S.A.

It is reported in the *Survey* of the National Electrical Manufacturers' Association that twenty-eight States in the U.S.A. now have engineers' licence laws and that "Professional Engineers' Bills" are being brought before other State legislatures. A National Council for State Boards of Examiners exists, and a "Model Law for the Registration of Professional Engineers and Land Surveyors" has been evolved. There is also a National Bureau of Engineering Registration to investigate and verify the records of applicants for registration. In the "Model Law" and in practically all the other existing laws all types of engineers are covered by one certificate, each holder of which has a seal to be used on all plans, reports, etc.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

"Metrovick" Research Equipment

With the idea of fostering co-operation between science and industry, scientists have always been welcomed at the Trafford Park research laboratories of the Metropolitan-Vickers Electrical Co., Ltd. In the normal course of its research work the company has continually to develop fresh methods of technique and new or improved types of apparatus. From time to time it has constructed for others equipment similar to that which it uses itself, and in order to make these facilities more widely known a 78-page booklet, very copiously illustrated, has been published. It does not purport to be a comprehensive catalogue of scientific instruments, but is descriptive of some particular types of equipment originally designed for the company's own use which it would be prepared, if required, to make and supply to others who may be interested.

A Glass Convention

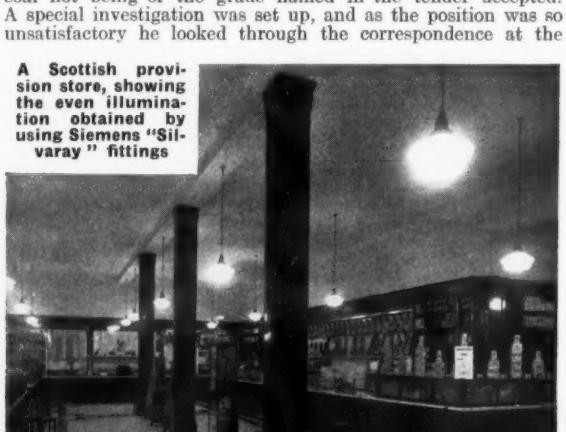
The British glass industry is holding its third convention at Buxton from May 18th to 20th. Sir Max Bonn will preside. Details of the programme will be obtainable shortly from the hon. secretary of the convention, Mr. G. Marchand, director of the Glass Manufacturers' Federation, Norwich House, 13, Southampton Street, W.C.1.

Prime Movers in the F.M.S.

Copies of a statement by H.M. Trade Commissioner at Singapore regarding new machinery (internal combustion engines, steam generators and water turbines) registered and installed in the Federated Malay States last year can be obtained by United Kingdom firms from the Department of Overseas Trade, 35, Old Queen Street, S.W.1. Reference No. G.X. 12436 should be quoted.

The Poplar Audit

On March 31st an extraordinary audit into the accounts of the Poplar Borough Council was opened by Mr. C. Gibson, District Auditor, on the instruction of the Minister of Health, and at the request of the Mayor and the Borough Council. The Town Clerk (Mr. H. E. Dennis) said the Council made the request in consequence of certain disturbing facts relating to the administration of the Electricity Department which had come to its knowledge. The Mayor (Councillor C. W. Key), said that when the new power station was built, it was decided to use "Durham peas" coal and contracts were entered into with six firms. They had evidence in one instance of coal not according to contract being delivered, and in another of coal not being of the grade named in the tender accepted. A special investigation was set up, and as the position was so unsatisfactory he looked through the correspondence at the offices of the electricity undertaking. In his search he came across documents which he caused to be parcelled up and put in the custody of the Town Clerk, and also gave instructions that the electrical engineer's office be sealed up. He had found correspondence relating to activities on the part of Mr. Bowden which were not related to the work of the electricity undertaking, but which obviously had been conducted by the use of the Council staff. That was one of the reasons, when the unsatisfactory position had been revealed in the supply of coal, why it was decided by the Council to ask for an audit. At an earlier stage of the proceedings it was stated that the electrical engineer had been absent on sick leave since October last. The District Auditor stated that the inquiry might last for some months; arrangements could be made later for a semi-public day when he would make a statement.



A Scottish provision store, showing the even illumination obtained by using Siemens "Silvaray" fittings

Colour Lighting at Casani's Club

Colour lighting plays an important part at Casani's Club, Imperial House, Regent Street, W., views of which are to be seen on page 515. In the ballroom the main illumination from the cornices, as well as a number of decorative lighting effects of various kinds, is on the three-colour system controlled from a miniature theatre switchboard with dimmers. An excellent effect is obtained by the insertion in the walls of etched glass panels depicting different types of dances and illuminated from behind in colour. Glass through which light of any colour can be projected has also been used for the top of the tables, and well-planned systems of concealed lighting have been installed at the cocktail bar and the band platform. Between the stairways leading up to the restaurant is a unique electric clock which tells the time by means of the legs of a chromium-plated figure of a dancing girl on a face of black glass. There is an unusual type of lighting fitting in the lounge, while an illuminated statuette in an alcove is an attractive feature of the bridge room, which also contains a specially designed Berry fire with totally concealed elements. Electricity is used throughout the kitchen, the equipment including a range and grill, hotplates, boilers for coffee, milk, etc. (all by Carron Company), and a large Electrolux refrigerator. The electrical installation was carried out by Venreco, Ltd.

Blackburn Meadows

The English Steel Corporation informs us that it was responsible for the manufacture of the h.p. and l.p. turbine rotor forgings for the turbo-generators installed at Blackburn Meadows power station (see "Electrical Review," March 28th, p. 408) which was opened by H.R.H. Prince George on April 6th.

New Municipal Showrooms

Torquay Electricity Committee has expressed willingness to contribute a sum not exceeding £18,000 towards the purchase of a site for new showrooms and offices.

The Carlisle Electricity Committee has requested the engineer to report on the provision of a central showroom for the display and sale of electrical appliances and fittings.

Recent Contracts

The B.B.C. announces that a contract has been placed with Messrs. Higgs & Hill, Ltd., for the building of the Midland Regional station on the site recently acquired at Wychbold, near Droitwich. Preliminary work in connection with the contract will begin at once.

Messrs. Barnett & Soans, Ltd., of Kettering and Burton-on-Trent, have obtained the contract for the electric lighting and power installation at the new steel works, Corby, for Messrs. Stewart & Lloyds, Ltd.

Duties on Cathode Glow Discharge Tubes

A representation has been made to the Board of Trade regarding the exemption from duty of cathode glow gas-filled discharge tubes ("Photion" type), under Section 10 (5) of the Finance Act, 1926, which relates to key industry duties. Any communication should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, S.W.1, before May 5th.

The Moscow Arrests

The opening of the trial of the Metropolitan-Vickers Electrical Co.'s Moscow employés originally fixed for last Sunday was postponed till Wednesday. The following are the counsel for the defence: For Mr. Monkhouse, M. Nicolas Komodoff; for Mr. Thornton, M. Ilya Braude; for Mr. Cushny, M. Peter Lidoff; for Mr. Nordwall and Mr. Gregory, M. Aaron Dolmatovsky.

An article appearing in *Technica*, the organ of the Soviet Council of Heavy Industries, makes serious charges against the Metrovick Co., which Mr. Monkhouse, in an interview, has stated to be a gross misrepresentation and distortion of the facts.

The Bill giving the Government powers to deal with the importation of Russian goods into the United Kingdom has been passed.

A second White Paper was issued on Monday continuing the correspondence between Sir Esmond Ovey and Sir John Simon from the point at which the first White Paper left off (March 17th) and also publishing the letters between Mr. Strang, the *Chargé d'Affaires* at Moscow, and Sir John Simon after the British Ambassador had returned to England. Particulars are given of the methods employed in the examination of the accused men and the charges against Mr. Monkhouse and Mr. Nordwall are set forth in detail.

The Plastics Exhibition

The Plastics Industrial Exhibition was opened on April 5th at the Science Museum, South Kensington, by Mr. H. Ramsbotham, M.P., Parliamentary Secretary to the Board of Education.

Industrial Design Competition

Applications for entry forms and instructions for this year's competition of industrial designs, organised by the Royal Society of Arts, must be sent to the secretary of the Society between May 1st and May 8th, the last day for receiving entries being May 20th. Designs entered for the competition will be received at the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, London, S.W., between June 7th and June 9th. In the case of distant overseas competitors, entry forms will be received up to July 1st. After judging, which takes place in July, the prize and accepted designs will be exhibited to the public in the Exhibition Pavilion at the Imperial Institute from August 5th to August 31st.

The "Britram Nite-a-Lite"

The attractive display card shown in the accompanying illustration is being distributed by the Universal Electric Lamp Co., 61/63, Great Eastern Street, E.C.2, in connection with a new lamp, the "Britram Nite-a-Lite," which has just been placed on the market. This lamp, which has been designed especially for nurseries and corridors, has a 5-W filament, and is supplied for voltages of 200 to 250. It is handsomely boxed and carries the usual guarantee of 1,000 hours' life.

The "Britram Nite-a-Lite" display card

Trade with China

The Commercial Counsellor at Shanghai has observed that a considerable number of British firms are at the present seeking to establish connections in China. In corresponding with local firms, it is important, in their own interests, that United Kingdom firms should give full information about themselves, and furnish commercial references. By doing so they will increase considerably their chances of securing the right connections with the least delay.

For Sale

On April 20th, Messrs. Miller, Paxton & Fairmaner are to sell by auction electrical contractors' stock.

Coventry Corporation has electrical plant for disposal. (See our classified advertisements.)

Irish Free State Electrical Imports

A fair degree of activity prevailed in the electrical trade in the Irish Free State during February last, the month's imports of electrical machinery, fittings, and cognate apparatus and material attaining a value of £55,491, as compared with £37,206 in February, 1932. The appended table shows the aggregate imports during the first two months of the current year, the total showing an increase of £13,488.

	First two months. 1932. £	1933. £
Electrical machinery	26,665	25,931
Electric wires and cables	13,497	5,927
Wireless sets and parts	24,407	35,627
Electric lighting accessories and parts	8,343	8,415
Other electrical goods	21,499	33,282
Copper wire	1,390	107
Totals	£95,801	£109,289

Italian Foreign Electrical Trade

The appended table shows the Italian imports and exports of electrical machinery and apparatus during 1932 as compared with 1931. It will be seen that the imports show a decrease of £1,491,595, or over 41 per cent., and the exports a falling off of £347,715, or about 22 per cent.

	Imports. 1931. Lire. (Thousands omitted.)	1932. Lire.	Exports. 1931. Lire. (Thousands omitted.)	1932. Lire.
Accumulators and parts	5,280	974	2,735	2,290
Lamp bulbs	1,619	1,193	—	—
Electrical measuring instruments	3,855	3,599	393	383
Radio apparatus	56,114	19,891	6,349	3,872
Telegraph and telephone apparatus	47,997	40,674	24,175	24,422
Miscellaneous electrical apparatus	58,154	27,587	1,722	2,410
Electric furnace and other carbons	9,214	6,350	345	212
Insulated cables	2,069	819	12,917	3,334
Electricity meters	4,223	2,624	823	528
Insulated wire	3,323	998	9,327	4,346
Generators and motors "without collectors"	13,217	8,434	2,382	4,725
Generators and motors "with collectors"	16,984	14,632	20,325	22,950
Glass and porcelain insulators	597	333	3,034	1,177
Arc lamps	41	77	—	—
Incandescent lamps	11,028	7,857	4,517	1,274
Static transformers	4,820	3,360	15,977	12,139
Insulating tubes	79	21	218	46
Total lire	238,614,000	139,423,000	105,239,000	84,116,000
Total at 66½ lire to the £	£3,588,180	£2,096,585	£1,582,540	£1,234,825

An All-electric House at Sutton Coldfield

An all-electric house constructed to the design of Mrs. Brant, wife of Mr. W. Brant, of Messrs. George Ellison, Ltd., was opened last Saturday in Welford Road, Sutton Coldfield, by Mrs. Marshall, of the Electrical Association for Women. All the electrical appliances installed are of G.E.C. manufacture. The house, which was built by Messrs. T. A. Glynn, will remain open to the public until April 24th.

Conditions in Brazil

In a Department of Overseas Trade report on economic conditions in Brazil, the Commercial Secretary at Rio de Janeiro remarks that the foreign trade of the Republic is still decreasing in value and volume, and that the outlook shows little signs of immediate improvement. In summarising the whole position he refers to the paralysing effect upon commerce of the civil war of 1932, the disadvantages of the various restrictions and consequent loss of trade, and the limited character of the exportable resources. In 1931 the values of the principal electrical goods imported were as follows, the 1930 figures appearing in parentheses: Electric wires and cable, £72,000 (£346,000); electric lighting apparatus, £441,000 (£1,188,000); electric dynamos and generators, £49,000 (£151,000); electric motors, £56,000 (£176,000); transformers, £46,000 (£274,000).

Popularising the Electric Kitchen in America

The good work done by the electrical travelling kitchen train in America is described in the *Electrical World* in the following terms:—

"Back to Los Angeles goes the Warner Brothers-General Electric '42d Street Special' after having brought, in the best Hollywood fashion, the dual story of the new film '42d Street' and the General Electric kitchen to ingenuous America. With two-score movie stars and satellites aboard, the train, resplendent in gold and silver leaf, brilliantly lighted within and without, and bearing an all-electric kitchen of special construction, smashed its way into the public consciousness. Sponsors claim that 2,000,000 people got the message through parades in fourteen major cities, that 500,000 saw the train at its stops, that uncountable thousands saw it flash its way, a travelling signboard, through the night, that half a million people went through the exhibit, and that it was a great success for all concerned. Both sides of the train were electrically lighted with a total of 3,500 lamps, sun lamps were installed to preserve the delicate health and beauty of the stars and huge sun-arc lamps supplied by special generating equipment cast powerful coloured light beams into the sky. The all-electric kitchen replaced dining cars on its two trips."

Social Event

A performance of "The Sport of Kings" is to be given on April 25th by the Lewcos Staff Dramatic Society at the Guildhall School of Music, London.

The Mount Everest Flight

Several of the special spinnings which were incorporated in the aircraft used for the recent flight over Mount Everest were supplied by Benjamin Electric, Ltd.

Trade Announcements

Messrs. Chilcotts, Ltd., 240, Blackfriars Road, S.E.1, state that they have completed a reorganisation of their Gasket Cutting Department and have improved their facilities for cutting gaskets in all classes of materials, including vellumoid, fibre, cork, asbestos, and paper.

Messrs. James Gordon & Co., Ltd., have moved their offices in Windsor House, Kingsway, W.C.2, to the adjoining premises, Regent House.

Messrs. E. L. Youngleson, Ltd., have appointed Mr. Alvin E. Loe as sales manager of their "Val d'Or" electric drill department.

Messrs. Baxter & Caunter, Ltd., have been appointed sole agents for London and the South and South-Eastern Counties for the sale of "Tunion" lampholders manufactured by Messrs. G. Turnock, Aston, Birmingham.

Messrs. A. W. Beuttell, Ltd. ("Linolite") have recently appointed Messrs. W. E. Beardsall & Co., Ltd., 5, Victoria Bridge, Manchester, as their official agents for the north of England and Wales. Messrs. Beardsall will hold complete stocks.

Messrs. S. Bill & Co., Ltd., have appointed Messrs. Potter Cowan & Co., Ltd., 21-27, Pitt Street, Glasgow, as their agents for Scotland and Northern Ireland.

The British Aluminium Co., Ltd., has removed its Birmingham office and warehouse to Lawley and Landor Streets. (Telephone: Aston Cross: 5865-6.)

Easter Holidays

The offices of the Jackson Electric Stove Co., Ltd., & Ceag, Ltd., will be closed until Wednesday morning.

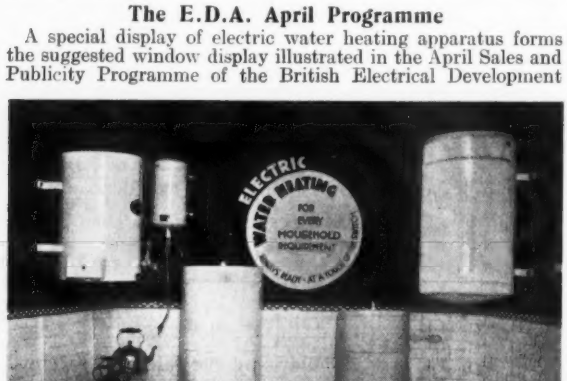
A Corporation as a Wireless Retailer

The Ilford Electricity Committee has considered a letter from the Wireless Retailers' Association relative to the Council's undertaking the sale of radio apparatus to the public at its electricity showrooms. Having regard to the Council's

statutory powers, the Committee does not see its way clear to take any action on the communication, and has directed the borough electrical engineer to proceed with the existing arrangements.

The E.D.A. April Programme

A special display of electric water heating apparatus forms the suggested window display illustrated in the April Sales and Publicity Programme of the British Electrical Development



The E.D.A. April window display

Association. The scheme is elaborated by the inclusion of electric kettles, saucepans, &c. The programme also illustrates seasonal advertisements, posters and two new publications. A price list of literature dealing with water heating, cooking and spring cleaning is included.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price April 12th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£141	—
Grade II ... ... ,,	£100	—
Grade III ... ... ,,	£51	—
c Brass (rolled metal 2" to 12" basis)... per lb.	7d.	—
c ,, Tubes (solid drawn) ... ... ,,	8¾d. to 9d.	—
c ,, Wire, basis ... ... ,,	7¾d.	—
c Copper Tubes (solid drawn)... ... ,,	9¼d.	—
g ,, Bars (best selected)... ... per ton		
g ,, Sheet... ... ... ,,	£61	—
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£34 5s.	—
d ,, ,, Sheets ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£44	£1 inc.
d ,, ,, H.C. Wire ... per lb.	7d.	¼d. inc.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	4¼d.	¼d. dec.
i Iron, Pig (Cleveland No. 3)... ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig ... ... ,,	£12 5s.	5s. inc.
g Mercury ... ... per bot.	£9 to £9 12s. 6d.	—
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	10¼d.	—
p ,, ,, rolled strip & sheet ,,	10¼d.	—
p ,, ,, wire ... ... ,,	11¼d.	—
o Platinum ... ... per oz.	£7 10s.	—
d Silicium Bronze Wire ... ... per lb.	8¼d.	¼d. inc.
r Steel, magnet, in bars ... ... ,,	7¾d.	—
g Tin, Block (English)... ... ... per ton	£156 15s. to £158 15s	£5 15s. inc.
s ,, Wire, Nos. 1 to 16 ... ... per lb.	2/11	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co.,Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
f W. F. Dennis & Co.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.

New R.M.A. Membership Qualification

The Wireless and Gramophone Trader learns that in future firms applying for admission to the Radio Manufacturers' Association will be required to submit, with their application, an auditor's certificate to the effect that their net turnover derived from the manufacture of radio goods in the twelve months prior to the date of application was not less than £10,000. This stipulation is in accordance with the Association's policy of exercising the greatest care in the scrutiny of applicants' status, in order to admit only firms who have established themselves firmly in the industry.

New Catalogues and Lists

Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.1.—Catalogue No. 676, relating to electric lighting fittings, with particulars of a number of important contracts carried out recently; it has 240 pages and is copiously illustrated. Also a brochure drawing attention to the activities of the company's Illuminating Engineering and Technical Department.

Wm. Sanders & Co., Falcon Electrical Works, Wednesbury.—Leaflets Nos. 112 and 113, dealing with two new "Sandalite" combined switches and fuses.

Artic Fuse & Electrical Manufacturing Co., Ltd., Birtley, Co. Durham.—A coloured folder giving particulars of the company's latest electric fires, including the new "Coal Flame" model.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, W.1.—Several publications describing Hotpoint washing machines, vacuum cleaners, irons, and other appliances.

Tube Products, Ltd., Popes Lane, Oldbury, Birmingham.—Publication No. 40.133, on electrically welded steel tubes.

McLeod & McLeod, 329, High Holborn, W.C.1.—A leaflet detailing the company's products.

Troughton & Young, Ltd., 143, Knightsbridge, S.W.1.—An illustrated catalogue of "Ultralux" utility lighting fittings. Also a brochure on modern decorative lighting.

Ferranti, Ltd., Hollinwood, Lancs.—A reprint from the Electrical Review relating to moving-coil voltage regulators.

British Insulated Cables, Ltd., Prescot, Lancs.—Lists Nos. P.F.108 and P.273, giving particulars of service cut-outs, and "Rampend" traction fittings.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A folder describing the company's improved tough-rubber sheathing for trailing cables. Also a leaflet introducing a new large universal "Bakelite" joint box.

Sunbeam Vacuum Cleaner Co., Ltd., 28-30, Shepperton Road, Islington, N.1.—Literature relating to the "Sunbeam" and "Triumph" vacuum cleaners.

A. P. Lundberg & Sons, Ltd., 477-489, Liverpool Road, Holloway, N.7.—Publication No. E1.104, giving details of the "Five-fifteen" multi-way plug-adaptor.

Sun Electrical Co., Ltd., 118-120, Charing Cross Road, W.C.2.—Leaflets describing various types of "Solrae" reflectors.

Drayton Regulator Co., Ltd., West Drayton, Middlesex.—Lists Nos. 175 and B.P.40 relating respectively to seamless and built-up metal bellows, and snap-acting lever operated switches.

B.E.N. Patents, Ltd., 92, Tottenham Court Road, W.1.—List No. CB. 22 illustrating and describing B.E.N. compressed air fittings and connections.

Birmingham Electric Furnaces, Ltd., Birlec Works, Tyburn Road, Erdington, Birmingham.—A leaflet giving details of developments in forced air circulation furnaces.

Electrical Equipment & Carbon Co., Ltd., 107/111, New Oxford Street, W.C.1.—A price list (No. M.22) of "Elin" a.c. motors.

Negretti & Zambra, 38, Holborn Viaduct, E.C.1.—A wall card showing the correct temperatures and times for cooking various foodstuffs and illustrating one of the company's oven thermometers.

Ray Engineering Co., Ltd., Waterdale Works, Southmead, Bristol.—A folder dealing with the company's standard battery-charging equipment.

Bankruptcy Proceedings

C. E. Wooton, electrical engineer, 10, Cemmaes Terrace, Collett Road, and 109, Marlowes, Hemel Hempstead, Herts.—The receiving order was made recently on the debtor's own petition, and the statement of affairs filed shows liabilities of £1,605, and assets of £369, leaving a deficiency of £1,236. At the first meeting of creditors, held recently, the matter was left in the hands of Mr. H. C. McMillan, 5, High Holborn, W.C.1, as trustee, with a committee of inspection. The following are the principal creditors:—Baxter & Caunter, Ltd., £84; Crompton Parkinson, Ltd., £67; Callender's Cable & Construction Co., Ltd., £215; C. Dowse, £100; Electrical Manufacturing & Supplies Co., £339; Falk, Stadelmann & Co., Ltd., £63; Giffins, Ltd., £56; Maxwell & Co., £68; E. E. Wooton, £300.

A. C. Gardner, wireless dealer, 7, Midland Road, Derby.—The first meeting of creditors was held on April 4th at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham.—The debtor attributed his failure to insufficient profits to cover overhead expenses, and having to maintain gratis wireless sets which he had sold. His statement of affairs showed ranking liabilities of £574, with assets of £171, leaving a deficiency of £403. The matter was left in the hands of the Official Receiver.

H. M. P. Bridge (trading as the Bellhouse Radio & Electrical Salon), 44, Bellhouse Road, Sheffield.—The public examination was held at the County Court Hall, Sheffield, on April 6th, when it was stated that the liabilities amounted to about £730, and the assets were estimated to realise £300. The debtor attributed his failure to heavy overhead charges, selling goods under cost, and an execution levied for debt. The examination was adjourned.

D. Boulton, radio and electrical engineer, Old Town Avenue, Plymouth.—Receiving order made April 3rd on debtor's own petition.

H. H. Edwards, electrical engineer, 26, Churchfields, Wellington, Somerset.—First meeting April 21st at the Parade Assembly Rooms, Taunton. Public examination May 5th at the Municipal Buildings, Taunton.

E. Whitehouse, electrical and radio engineer, 29, Westfield Street, St. Helens.—Trustee, Mr. P. S. Booth, 2, Bixteth Street, Liverpool, appointed April 3rd.

H. F. Spence (H. F. Spence & Sons), electrical engineer, 2, Eureka Terrace, Honiton.—Trustee, Mr. A. Collins, 28, Baldwin Street, Bristol.

H. Bannister (H. Bannister & Co.), electrical goods factor, 3, Newmarket Lane, Manchester.—Last day for receiving proofs for dividend April 21st. Trustee, Mr. N. McKellen, 20, Booth Street, Manchester.

R. Robinson, electrical engineer, The Arcade, Waterfoot, Lancs.—Receiving order made March 31st on debtor's own petition. Public examination May 5th at the County Court Buildings, Fleece Street, Rochdale.

H. A. Langlois (Electrical Installation Co.), electrical contractor, 2, Atlas Place, Cardiff, and at Leicester.—Public examination May 5th at the Law Courts, Cardiff.

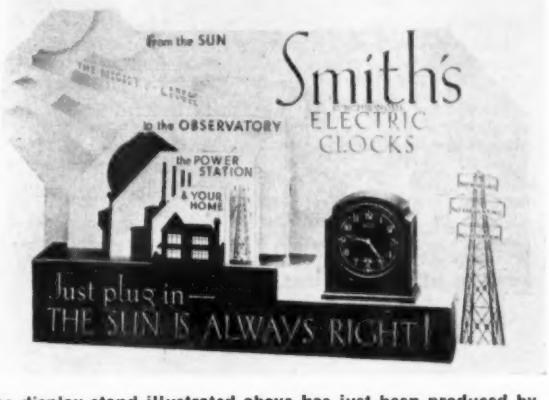
F. Lockett, electrical dealer, 45a, Parrs Wood Road, Didsbury, Manchester.—Last day for receiving proofs for dividend April 19th. Trustee, Mr. F. Murgatroyd, Byrom Street, Manchester, Senior Official Receiver.

Company Liquidations

X-Rays, Ltd., 47, Red Lion Street, W.C.—The report of the Official Receiver (who is also acting as liquidator), shows total liabilities of £23,866 (ranking £11,702), and assets of £12,163 (absorbed in the debenture claims), leaving a deficiency of £15,256 with regard to contributories, the issued capital amounting to £3,554. The failure of the company is attributed to the reduced spending power of hospitals and other institutions to which most of the company's products were sold and also to the fact that Irish hospitals and institutions do not purchase so much of their X-ray apparatus from this country as hitherto. In the opinion of the Official Receiver the failure was contributed to by mismanagement on the part of the directors in that during the time in which the company's business was being carried on no attempt appears to have been made to write down the stock to its proper value. Had adequate depreciation from time to time been written off the stock, which was of a highly technical nature, the acute financial position of the company must have been apparent to the directors, and it was reasonable to assume that a considerable portion of the liabilities to unsecured creditors in the last two years and ten months would never have been incurred.

Beam, Ltd., 35, Farringdon Road, E.C.—Under the compulsory liquidation of this company the report of Mr. E. T. A. Phillips, Official Receiver and Liquidator, has been issued, together with a summary of the statement of affairs. The liabilities are returned at £15,632, against assets of £392, and the account with the contributories shows a total deficiency of £15,826, the issued capital consisting of 603 ordinary shares of £1 each. The company was promoted in September, 1927, by Albert Lester and Charles Marquis to acquire from them the trade name "Beam" in connection with electric batteries and loudspeakers, and to carry on business as factors of wireless sets and components, &c. The failure was attributed to shortage of working capital, trade depression, and to the removal of the company's name from the factor's list of the Valve Manufacturers' Association. In the opinion of the Official Receiver the failure is due to gross mismanagement.

Unalite, Ltd., lighting specialists, 7, Lamb's Conduit Street, W.C.1.—The statutory meeting of creditors was held recently



The display stand illustrated above has just been produced by Messrs. Smith's English Clocks, Ltd., to bring home to the public the merits of synchronous electric clocks

at the offices of Messrs. Mark Banus, Harrison & Co., 25, Finsbury Square, E.C.2, when Mr. Simon, one of the directors of the company, presided. A statement of affairs was submitted which disclosed liabilities of £1,210, of which £1,185 was due to the trade and other unsecured creditors, and there was a contingent liability in respect of a lease of £25. The assets totalled £135, leaving a deficiency as regarded creditors of £1,075. It was reported that the company was formed in January, 1932, when it took over a private business, and that its operations had never been successful. A resolution was passed confirming the shareholders' nomination of Mr. Mark Banus as liquidator. A committee of inspection was also appointed consisting of the representatives of the Revo Electric Co., Ltd., Stella Lamps, Ltd., and the J.B. Electric Co., Ltd.

Brownie Wireless Co. of Great Britain, Ltd.—Winding up voluntarily. Liquidator, Mr. A. J. Foster, 37, Walbrook, E.C.4.

Robersons, Ltd.—Particulars of claims by April 24th to Messrs. Wild Collins & Crosse, Kennan's House, Crown Court, Cheapside, E.C.

Dissolution of Partnership

Western Electric Lamp Co., electrical factors, 135, Princess Street, Manchester.—Messrs. H. B. Goble and R. C. Rusden have dissolved partnership. Mr. Rusden will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Barking.—Relief of Rates.—A sum of £2,000 is to be transferred from the profits of the electricity undertaking for the relief of the rates.

Batley.—New Domestic Tariff.—The Town Council has approved a new tariff, with a fixed charge of 15 per cent. per annum of the first £50 of rateable value and 10 per cent. of the rateable value above £50 (minimum fixed charge, £2 5s. per annum), plus a "unit" charge of 3d. (minimum of 150 kWh per quarter).

Brandon.—Overhead Lines.—The East Anglian Electric Supply Co., Ltd., is to put in hand at once the erection of overhead lines in the parishes of Sapiston, Fakenham, Euston, and Barnham.

Bristol.—New Cables and Plant.—Owing to the increasing demand for electricity, it will be necessary shortly to lay cables between Portishead generating station and Avonmouth and to provide the necessary switchgear and sub-station equipment at an estimated cost of £126,636.

Burnley.—Bulk Supply.—The Electricity Committee has decided to take a bulk supply to a maximum of 1,000 kW from the Central Electricity Board next winter.

Carlisle.—Mains Extensions.—The City Council is to extend mains in the city at a cost of £566 and in rural areas at a cost of £898.

Canada.—The Ontario Power Plant.—According to *The Times*, the Premier of Ontario, Mr. Henry, speaking in the provincial Legislative Assembly last Friday, declared his willingness to appoint a Royal Commission to investigate the acquisition of the Ontario Power Service Corporation by the province if any member of the Legislature suggested that the slightest loss accrued to the province. Mr. Henry admitted that he owned $25,000 worth of the company's bonds when he negotiated for the acquisition of the property by the publicly owned Hydro-electric Commission. He has been criticised for several weeks by leading members of his own party, who demand his resignation.

Colchester.—The Nayland Undertaking.—The Electricity Committee has received a letter from the Nayland Electric Light & Power Co. asking whether the Council would be willing to afford a bulk supply of electricity or, alternatively, to purchase the undertaking. Nayland is not within the Council's area of supply, and the town clerk has been asked to interview the proprietor of the company to inform him of the Committee's views.

Electricity for Jay Wick Lane.—If the Clacton Urban District Council decides not to extend its own mains, the Electricity Commissioners state that they will be willing to entertain a Fringe Order application by the Colchester Corporation in respect of premises in Jay Wick Lane which are in the Clacton area.

Loans Sanctioned.—Sanction has been obtained to loans of £5,000 for transformers and switchgear at the generating station, with sub-station plant, £5,000 for domestic apparatus, and £2,880 for an e.h.p. line to Jay Wick Sands Estate.

Crewe.—Loans.—The Town Council has applied for sanction to loans of £10,500 for services, £1,500 for mains, £7,300 for meters, and £2,200 for assisted wiring.

Croydon.—Extensions.—The Electricity Committee is to extend mains at a cost of £4,449, including £1,280 for distributors, from Virginia Road sub-station to Carolina Road. The Committee also recommend the laying of a cable costing £877 to Messrs. Blackwell's new factory in Lansdowne Road.

Loans.—Application is to be made for sanction to a loan of £6,000 for meters in connection with the assisted wiring scheme, and permission has been received to borrow £11,400 for services and £20,000 for house-wiring installations.

Hire-purchase of Electric Signs.—The letting of electric advertisement signs on hire-purchase terms is recommended by the Electricity Committee.

Darlington.—Mains Extensions.—The Town Council is to lay l.p. mains in various parts of the borough.

Dewsbury.—Street Lighting.—The Lighting Committee has informed the Mirfield Gas Co. that the Corporation does not intend to continue the agreement with the company for street lighting at Ravensthorpe after July, and has asked for a report to be prepared on the question of future street lighting in the district.

East Ham.—Lighting of Council Chamber.—The Electricity Committee has under consideration the question of approving a suitable scheme for the lighting of the Council Chamber.

New Cooker Hiring Scheme.—A new scheme has been introduced for the hiring of electric cookers at an inclusive rate of 1d. per kWh through a slot meter to cover the rental of the cooker, wiring, and supply of electricity for all domestic purposes.

Eccles.—Loans.—The Town Council has applied for sanction to loans of £1,232 for a transformer kiosk, equipment, &c., at Monton Green, and of £1,264 for a sub-station at Lane End.

Edinburgh.—Illuminated Advertisements.—The question of illuminated advertisements in Princes Street was discussed by the Corporation on April 6th, and it was resolved that coloured lights should not be permitted.

Haslingden.—Relief of Rates.—The Electricity Department is to provide £750 towards the rates in 1934, the same amount as in the previous year.

Hastings.—New Sub-station.—The erection of a sub-station at Shepherd Street and the provision of sub-station equipment at a total cost of £32,000 are recommended by the Electricity Committee.

Street Lighting Improvements.—It is proposed to improve the lighting arrangements in various streets at an estimated cost of £4,775.

Extensions.—The Electricity Committee recommends the extension of mains to Henley's Down, Catsfield, at an estimated cost of £1,750, and to Beckley Corner Lane, Four Oaks, at a cost of £768.

Liverpool.—Loans.—In connection with developments in the West Lancashire rural district, the Corporation is seeking powers to borrow £5,500 for unspecified mains extensions and £750 for new sub-stations, transformers, and sub-station plant.

London.—Fulham.—The Electricity Committee is to extend mains in Aintree Street, Munster Road, Dawes Road, Bayonne Road, and Lillie Road at an estimated cost of £1,147. A sub-station is to be erected at the Lillie Road recreation ground and a two-phase cable is to be laid from New King's Road to Cresford Road at a cost of £240.

St. Pancras.—The Electricity and Public Lighting Committee is to carry out mains extensions costing £740. Sanction has been received to loans of £1,400 for mains and £600 for switchgear in connection with the supply to premises in Henry Street, Gray's Inn Road.

Hackney.—Application is to be made by the Borough Council for permission to borrow £30,000 for meters and demand indicators, and £20,000 for service lines.

Manchester.—Cheaper Electricity.—A concession of £65,000 will be made to consumers by the following reductions in electricity charges recommended by the Electricity Committee:—Lighting for general uses: First 5,000 kWh per quarter, 4½d. per kWh (against 4¾d.); next 5,000 kWh, 4d. (4¼); next 20,000 kWh, 3¼d. (4d.); next 20,000 kWh, 3¼d. (3¾d.); next 50,000 kWh, 2¾d. (3d.); all over 100,000 kWh, 2¼d. (2½d.). Industrial power for small users: A fixed charge of £4 15s. per kW for the first 10 kW, £4 5s. for second 10 kW, and £4 all over 20 kW, plus a running charge of 0.45d.; previously the fixed charge was £5 per kWh for any quantity, with a running charge of ¼d. Substantial reductions are also made in the industrial power rates for large consumers, and power for hoists is now available at 3d. per kWh instead of 3¼d.

All-electric Houses.—The Housing Committee has made revised terms for equipping houses in the Royal Oak area at Wythenshawe as all-electric dwellings.

Continued Progress.—During February the Electricity Department showed an increase of 1,787 kW. in connections, bringing the total up to 529,079 kWh, while applications for supplies (including additional supplies) numbered 1,898, representing a total of 3,701 kW. There were 165 new cookers connected, making a total of 11,080 now on circuit; orders for the hire of cookers amounted to 184. Hired wash-boilers on circuit now total 405.

Newcastle-under-Lyme.—Special Order.—The Corporation is applying to the Electricity Commissioners for a Special Order authorising it to extend its supply area to include the former urban district of Wolstanton United and parish of Clayton, and part of the former urban district of Audley and parish of Keele.

Newcastle-upon-Tyne.—Cables over River.—On Sunday cables forming part of the Central Electricity Board's Newcastle-Galashiels transmission line were laid across the River Tyne, a few miles west of Newcastle, by British Insulated Cables, Ltd.

Plymouth.—Free Wiring Progress.—Up to the present £51,000 has been spent by the Corporation on free wiring, and 12,099, or about 30 per cent. of the consumers, have taken advantage of the free or assisted wiring schemes. The interest and sinking fund charges in connection with the scheme are now £6,379, the revenue from the installations to meet the charges amounting to £6,426. Application has just been made for sanction to another loan of £10,000 for the free wiring scheme.

Portland. Loans Sanctioned.—The Urban District Council has received sanction to loans of £1,305 for excess expenditure on overhead lines, £135 for meters, and £900 for domestic apparatus.

Apparatus Hiring Charges.—Wash boilers and fires are to be hired out at the following quarterly charges: Wash boilers, 2s. 9d. Fires: 1-kW, 1s. 6d.; 2-kW, 2s.; 3-kW, 2s. 6d.

Portugal.—Electrical Progress.—From the Portuguese Government Department of Electrical Services we have received a copy of the "Estatistica das Instalacoes Electricas em Portugal" giving details of the position of the electricity supply industry in that country at the end of 1931. At that date there were seventy-six hydro-electric power stations in the country with a total capacity of 37,578 kW, and 313 steam- and internal-combustion-engine stations aggregating 147,302 kW. The bulk of the plants are of very small capacity, there being 218 stations of under 100 kW each and only twenty with capacities over 1,000 kW. The output of the publicly owned stations during 1931 amounted to 219,306,534 kWh, of which the hydro-electric plants were responsible for 84,671,239 kWh and steam- and internal-combustion plants for 134,635,295 kWh. The total production for the country amounted to 267,784,029 kWh (92,860,268-kWh hydro-electric and 174,023,761 steam and internal-combustion-engine). The 1931 output of the publicly owned plants showed an increase of 7 per cent. over 1930, but there was a decrease in the production of the privately owned plants, reducing the total increase for the year to 3 per cent. Lisbon and Oporto are the two main power-consuming centres, the former city taking 80,015,146 kWh in 1931 and Oporto 36,094,330 kWh. At the end of the year there were 1,434 miles of overhead and 253 miles of underground transmission lines in use in Portugal. The pressure employed for most of the transmission lines ranges from 5,000 to 7,000 V, there being only about 370 miles of lines working at 30,000 V and over.

Reading.—Purchase of Undertaking.—The Town Council has definitely decided to purchase the electricity undertaking of the Reading Electric Supply Co., Ltd. The Electricity Commissioners, in giving consent to the exercise by the Corporation of its rights to purchase, have imposed a condition that the Corporation shall, if required, supply electricity to the Thames Valley Electric Supply Co., which provides electricity in a large area in the district.

Reigate.—Revised Charges.—The Town Council has adopted the following revised scale of charges:—Flat rates: Lighting, 4¾d. per kWh; cooking and heating, ¾d.; commercial power, ¾d.; shop-window lighting, 3½d.; cinema supplies, 3½d. Two part tariffs: Domestic, fixed annual charge based upon size of house ranging from £2 to £3 7s. 6d., with a "unit" charge of ⅝d.; business premises, fixed annual charge of £1 per 100 W of installed capacity for lighting, plus ¾d. per kWh. There are no meter rents, but in the case of small houses wired under the hire-purchase scheme there is an extra 2d. per kWh to pay until the installation cost has been met.

Rugby.—New Mains.—The Town Council is to relay mains in various roads at a cost of £800, excluding cables.

Sheffield.—Mains Extensions.—The Electricity Committee is to extend mains at a cost of £16,165.

Shrewsbury.—Relief of Rates.—The Finance Committee is to allocate £1,030 from the electricity profits to rate relief.

Todmorden.—Tariff Alterations.—The Electricity Committee recommends the following alterations in the electricity charges:—Lighting, heating, and domestic rate: A reduction of ¼d. in the "unit" charge. Power: First 100 kWh a month, 3d. per kWh; next 500 kWh, 2d.; all over 600 kWh per month, 1d.; minimum charge, 10s. per quarter. General power consumers: A reduction of 0.15d. in the "unit" charge in each group, subject to an altered fuel cost clause. Large power consumers: A reduction in the "unit" charge, subject to provisions as to fuel cost and a rates clause.

Torquay.—New Sub-station.—The Electricity Committee is to erect a sub-station in Torwood Street at a cost of £16,000, including the installation of the necessary apparatus and switchgear and the alteration of the mains.

Uttoxeter.—Electricity for Rocester.—The Urban District Council proposes to extend an overhead line to Rocester and apply for sanction to borrow £19,039 for the purpose.

Wakefield.—Loans.—The Electricity Committee is to apply for sanction to the borrowing of £5,000 for meters. Permission has been received to the following loans: £25,000 for mains and services, £5,000 for sub-station equipment and kiosks, £5,000 for hire-purchase wiring, and £5,000 for the provision of consumers' apparatus.

Relief of Rates.—The Finance Committee has decided to allocate £3,000 from the profits of the electricity undertaking for the relief of rates.

Walsall.—Extensions.—The Electricity Committee is to extend mains and provide new sub-station equipment, &c., in order to meet the estimated increased demand for electricity at a cost of £6,583. The parish of Essington is to be supplied at a cost of £1,200, and £2,400 is to be spent on the provision of a duplicate feeder between Lazy Hill Lane, Aldridge, and Aldridge sub-station, with the necessary e.h.p. switchgear, so as to provide an alternative supply in case of failure of the existing feeder.

Loan.—Application is being made for sanction to the borrowing of a further £25,000 to meet the estimated expenditure on services up to March 31st, 1936.

Walton-on-Thames.—Reduced Charges.—The Urban District Council has reduced the lighting flat rate from 5½d. to 5d. per kWh, and the heating rate from 2d. to 1¾d. Some reduction is also contemplated in the combined tariff.

Weymouth.—Cheaper Electricity.—The Town Council has made the following reductions in charges to consumers in Wyke Regis, Upwey, Broadwey, and Preston: Lighting, from 7½d. to 6d. per kWh; heating and power, from 1.875d. to 1½d.; water heating, cooking, and domestic contracts from 1d. to ¾d.

Wolverhampton.—Extensions.—The Electricity Committee is to provide an additional sub-station at Fieldhouse for the Barnhurst district at a cost of £2,144, and is to extend the distribution system in the Woodthorne Estate, Wrottesley Road, and Wergs Road areas at a cost of £1,910.

Worthing.—Improved Lighting for Parade.—The Parade Committee is to improve the lighting at the parade and bandstand at a cost of £600.

Traction

Belgium.—Trolley-buses at Liège.—The Liège Tramways Co. has secured a concession to operate a trolley-bus service between Liège and Ougrée along the right bank of the River Meuse.

Blackpool.—Free Passes Cancelled.—All the free passes on the Blackpool trams and buses have been cancelled by the Transport Committee.

Carlisle.—Traffic Signals.—The Ministry of Transport has made a grant of £449 to the City Council in respect of the installation of traffic control signals at three junctions. The total cost will be £743.

Chesterfield.—Overhead Line Renewals.—Sanction has been received to a loan of £1,773 in connection with the renewal of the overhead trolley lines between Brampton and Whittington Moor.

Croydon.—Doubling of Track.—The Tramways Committee is to double the tram track in South End at a cost of £4,545.

Glasgow.—Electrification of Subway.—The proposal to electrify the Subway was unanimously agreed to at a recent meeting of the Transport Committee. This decision follows upon the experimental electrification between two of the stations, the results of which were considered eminently satisfactory. The estimated cost of the scheme is about £100,000, but it is stated that there will be a saving with electrification of about £28,000 a year. The accumulated deficits on the operation of the Subway now amount to about £180,000. The electrification proposal will come before the Corporation and it also requires the sanction of the Ministry of Transport. Under the present system coaches run at a speed of between 12 and 13 m.p.h., but on the recent trial run on the electrified section a speed of approximately 21 m.p.h. was easily attained.

Hull.—Trolley-buses.—The Transport Committee is considering the question of introducing trolley-buses in the town.

L.M.S. Railway.—A Pioneer Electrified Line.—Twenty-five years of electric traction will be completed to-day on the line between Lancaster, Morecambe and Heysham. This line was constructed by a company known as the "Little" North Western, to distinguish it from the London & North-Western Railway, and the first section from Lancaster (Green Ayre) to "Poulton Station and Harbour" (now Morecambe) was opened in June, 1848. The railway which by 1850 extended from Morecambe to Clapham Junction (Yorkshire), was acquired by the Midland Railway in 1871. The Lancaster-Heysham section was converted to electric traction on the h.p. single-phase system, with overhead transmission, in 1908.

London.—Success of Trafalgar Square Signals.—The new automatic traffic control system inaugurated in Trafalgar Square last week has been operating most satisfactorily, but it is possible that some slight modification may be introduced to assist pedestrians in crossing.

Middlesbrough.—The Transport Merger.—A sub-committee of the Tramways Committee appointed to go into the question of the proposed merging of the transport undertakings of the Corporation and the United Automobile Services, Ltd., has come to the conclusion the terms offered by the latter are not acceptable and therefore recommends the discontinuance of the negotiations.

Abandonment of Linthorpe Trams.—The Tramways Committee has decided to proceed as soon as possible with the abandonment of the tram service on the Linthorpe route.

Communications

China.—International Cable Agreement.—After negotiations which have extended over several years an important agreement affecting the rights and interests of the international cable companies in the Far East has been signed at Nanking between representatives of the Ministry of Communications and officials of the Great Northern, Eastern Extension, and Commercial Pacific Cable Companies. The main heads of the agreement, according to a Ministry of Communications statement, are as follows: (1) The companies' cable landing rights in China will be continued for fourteen years; (2) the Ministry of Communications will take over acceptance and delivery arrangements in Shanghai, subject to certain assurances and safeguards, including the retention of the present counter staffs, so as to ensure the maintenance of the present standard of efficiency (hitherto acceptance and delivery have been dealt with by the cable companies themselves); (3) the terminal rates for outgoing and incoming cables will be revised; (4) during the period of the contract the cable companies shall continue to use the telegraph lines connecting the cables with their offices, as is the case, for instance, between Woosung and Shanghai.—*Reuter* (Nanking).

France.—Radio Station Fire.—The Toulouse broadcasting station has been closed down temporarily following a destructive fire and damage caused by water.—*Reuter* (Paris).

Glasgow.—Telegraphy.—The newly equipped telegraph operating room at the General Post Office, George Square, Glasgow, was officially opened by Lord Provost Swan on April 5th. There was a large party present to inspect the new plant, and Postmaster-Surveyor Westbury, welcoming the guests, stated that the teleprinter had superseded the Morse and other forms of telegraph apparatus.

Great Britain.—Radio Relay Exchanges.—The Northfleet U.D.C. Works Committee has refused to allow the Gravesend Radio Central Exchange, Ltd., to connect fifteen houses in Waterdales to the company's exchange.

The Oxford Corporation has granted Oxford Broadcasting Relay, Ltd., a wayleave for the erection of wires at the rear of houses in Walton Street belonging to the Corporation, subject to the tenants not objecting.

The Enfield U.D.C. General Purposes Committee has deferred consideration of applications from Universal Wireless Relay, Ltd., and others for permission to establish a relay exchange in Enfield. The clerk reported that Rediffusion, Ltd., with whom the Council entered into an agreement in November, 1931, had applied to the Middlesex County Council for a licence to place wires across county highways, but the application had been refused. The Committee recommends that the engineer be instructed to interview the county engineer with regard to the application.

The Sandwich Town Council has refused Mr. B. Simms, of King Street, permission to establish a service in the town.

Radio Relay Exchanges.—Blackpool Highways Committee is to hold a special meeting for the further consideration of the proposed relay of wireless programmes in the borough by Rediffusion, Ltd.

The Lewes Town Council has refused an application by the Southern Relay Service, Ltd., for permission to cross borough roads with wires.

Lithuania.—Telephony.—On July 1st last 16,039 telephones were in use, and on January 1st this year 16,361. At present there are 4,902 subscribers to the Kaunas (Kovno) telephone service, against 5,130 in 1931. Of this number in 1932, 365 fell to the share of the suburbs, against 385 in 1931. Receipts from the automatic telephones in 1932 amounted to about Lits 33,000. For the entire country the lowering of the tariff has led to an increase of subscribers. It is also reported that the Postal Administration intends still further to extend the

Aircraft equipment type "A.D.6N," as fitted in the "Dragon Moth" planes for the new air services of Hillman Airways, undergoing tests at the Marconi Works, Chelmsford

Kaunas city zone, which will lead to the introduction of the telephone in the outlying districts.

Palestine.—New Telephone Service.—A public telephone service between all parts of Great Britain and Jerusalem, Haifa, Jaffa, and Gaza was inaugurated on April 7th. The new service is being operated *via* the Anglo-Egyptian radio-telephone channel to Cairo and thence by land-line to Palestine.

Philippine Islands.—Telephone Service.—A commercial 'phone service between the United States and its most distant dependency, the Philippine Islands, has been opened through short-wave radio-telephone stations near San Francisco and Manila. The American Telephone & Telegraph Co. has arranged with the Philippine Long-Distance Telephone Co. for the interconnection of the wire lines of the two systems by a 7,000-mile short-wave channel linking the Bell System stations in California and stations of the Radio Corporation of America in the Philippines. The opening marks the second step in the expansion of the Bell System across the Pacific. Connection with the Hawaiian Islands through the California stations was made late in 1931. Tests are already in progress for the eventual establishment of a service with Japan and other parts of the Far East.—*Reuter's Trade Servive* (New York).

Public Loud-speakers.—Court Decision.—In the Chancery Division on April 5th the Performing Rights Society, Ltd., sought an injunction to restrain Hammond's Bradford Brewery Co., Ltd., from permitting the George Hotel, Brighthouse, to be used for the performance in public of musical works without the payment of royalties, and claimed damages for alleged infringement of copyright by the unauthorised reproduction by loudspeaker of music broadcast by the B.B.C. The judge decided in favour of the plaintiffs. This is a test case and is likely to be taken to the Court of Appeal.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Aberdeen.—April 20th. Education Committee. Various works, (including heating and electrical) at reconstructed Kittybrewster School. Mr. J. A. O. Allan, architect, 25, Union Terrace, Aberdeen.

April 21st. Royal Mental Hospital. Various works, including electric lighting, at two new blocks and extensions. Mr. J. B. Nicol, architect, 367, Union Street, Aberdeen.

Ashford.—April 21st. Electricity Department. Two 6,600-V truck-type cubicles. (April 7th.)

Australia.—Melbourne.—June 7th. City Council. One or two boiler units. (G. 12425.)*

May 23rd. Posts and Telegraphs Department. Submarine cables (A.X. 11763)*, telephone protective apparatus (A.X. 11764)*, and v.i.r. lead covered cable (A.X. 11765)*.

Brisbane.—June 22nd. City Electric Light Co., Ltd. 45-kV and 11-kV switchgear. (A.X. 11749.)*

July 20th. Supervisory control equipment for circuit breakers. (A.X. 11750.)*

Sydney.—June 14th. N.S.W. Department of Railways. 500-kW turbo-alternator for Zarra Street power station. (A.X. 11762.)*

Barmouth.—April 24th. Urban District Council. Laying of distribution cable for public lighting, &c. (See this issue.)

Deptford.—May 3rd. Town Council. Lamps. (March 31st.)

Dover.—April 21st. Corporation. Switchgear, transformers and rotary convertor. (March 31st.)

Dumfries.—April 29th. County Council. House service meters. (April 7th.)

Egypt.—Cairo.—April 25th. Ministry of the Interior. Motors, control panels, meters, &c. (A.X. 11738.)*

May 15th. Waterworks equipment. (G.X. 12464.)*

Exmouth.—April 26th. Urban District Council. Electric lighting installation at the Pavilion on the Esplanade. Mr. Samuel Hutton, engineer and surveyor.

Glasgow.—April 24th. Electricity Department. Cables, flexibles, meters, and cable covering tiles. (April 7th.)

Hamilton.—April 29th. Corporation. Wiring and fittings for lighting and heating of the Mausoleum Cottage, Palace Grounds, Hamilton. Town clerk.

Lindsey.—County Education Committee. Electric lighting installation, Wragby School. Mr. P. W. Birkett, county architect, Lincoln.

Liverpool.—April 26th. Corporation. Cables, compounds, and tapes for street mains. (April 7th.)

April 24th. Generating plant. (April 7th.)

London.—London and Home Counties Joint Electricity Authority.—April 26th. Meters, transformers, and cables. (April 7th.)

Holborn.—May 16th. Borough Council. Automatic traffic control signals. (See this issue.)

Manchester.—April 19th. Electricity Department. Kettles, current transformers, meters, cables, industrial electric motors, and time switches. (April 7th.)

May 5th. Supervisory control gear and boiler house vacuum cleaning plant. (See this issue.)

Montrose.—April 19th. Town Council. Various works, including electric lighting, at housing scheme. Burgh surveyor.

Morocco.—Casablanca.—April 19th. Public Works Department. Electric cable and transformer sub-stations for supplying four coal-handling cranes. (A.X. 11733.)*

New Zealand.—Wellington.—May 23rd. Public Works Department. Three 110-kV oil-immersed circuit breakers. (A.X. 11751.)*

Salford.—May 1st. Electricity Department. Transformer and metal-clad switchgear panels. (April 7th.)

South Africa.—Johannesburg.—May 5th. Government Supplies Board. 2¼ miles of telephone cable and 1,280 miles of insulated wire. (A.X. 11761.)*

Sully (Glam).—April 20th. King Edward VII National Memorial Association. Electrical engineering work at Sully Tuberculosis Hospital. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Blackpool.—Cleansing Committee. Accepted. Electric vehicle.—Electricars, Ltd.

Transport Committee. Recommended. Omnibus batteries.—Chloride Electrical Storage Co., Ltd.

Electricity Committee. Accepted. Switch control boards.—Switchgear & Cowans, Ltd.

Bolton.—Public Assistance Committee. Accepted. Installa- of lift at hospital.—W. Wadsworth & Son.

Dover.—Town Council. Accepted. Cables for one year (£492).—Hackbridge Cable Co., Ltd.

East Ham.—Cleansing Committee. Recommended. Electric vehicle for refuse collectioln (£884).—Electricars, Ltd.

Ilford.—Electricity Committee. Accepted. Kiosk (£146).—Crompton Parkinson, Ltd.

Recommended. Switchgear. (£1,342).—General Electric Co., Ltd. Battery for tractor (£101).—Fuller Accumulator Co. Two 500-kVA transformers (£204 each).—Fuller Electrical & Manufacturing Co., Ltd. Three 300-kVA transformers (£153 each).—British Electric Transformer Co., Ltd.

Liverpool.—Corporation. Accepted. Electrical supplies required at the various hospitals and institutions.—Downes & Davies, J. A. Crabtree & Co., Ltd. Baxendale & Co., Ltd.; Lind & Co., Ltd.; General Electric Co., Ltd.; Siemens Electric Lamps & Supplies, Ltd.; G. P. Dennis, Ltd.; Walsall Conduits, Ltd.; Dodd & Oulton, Ltd.

Electric Power and Lighting Committee. Accepted. Twelve months' supplies of electric cookers and kettles.—Automatic Electric Co., Ltd.; Edison Swan Electric Co., Ltd. A.c. motors and starting gear for twelve months.—Walter F. Higgs; Morecambe Electrical Equipment Co., Ltd.; Erskine Heap & Co., Ltd. Insulated Cables.—Liverpool Electric Cable Co., Ltd.; Mersey Cable Works, Ltd. (twelve months' supplies).

London.—Hackney.—Electricity Committee. Recommended. Kiosk, complete with e.h.p. switchgear and two 500-kVA transformers (£1,200).—Johnson & Phillips, Ltd. E.h.p., l.p., and control cables.—British Insulated Cables, Ltd. House wiring cables and flexible cords for one year.—Rotapex, Ltd. Meters.—Metropolitan-Vickers Electrical Co., Ltd.; Chamberlain & Hookham, Ltd. Demand indicators.—Reason Manufacturing Co., Ltd.

St. Pancras.—Contracts and Stores Committee. Recommended. Switchgear, King's Road station (£15,168).—A. Reyrolle & Co., Ltd. Switchgear, Arlington Road sub-station (£1,474).—General Electric Co., Ltd. Repairing battery, King's Road station (£219).—Chloride Electrical Storage Co., Ltd.

Manchester.—Electricity Committee. Accepted. Two 2,000-kVA transformers.—Metropolitan-Vickers Electrical Co., Ltd. Electrically driven cable shears.—H. Berry & Co., Ltd. 33-kV switchgear.—British Thomson-Houston Co., Ltd. Electric cookers (annual contract).—Simplex Electric Co., Ltd.; Revo Electric Co., Ltd.; General Electric Co., Ltd.; Jackson Electric Stove Co., Ltd.; Siemens Electric Lamps & Supplies, Ltd.

Tynemouth.—Town Council. Accepted. Cable (£119).—Macintosh Cable Co., Ltd.

Wakefield.—Housing Committee. Accepted. Electric lighting and heating installation in houses in Brunswick Street.—H. Goodyear.

Wolverhampton. — Electricity Committee. Recommended. Reconstruction of switch cubicles (£368).—Ferguson, Pailin, Ltd.

Worthing.—Pier Committee. Recommended. Interior lighting, pier pavilion (£395).—Siemens Bros. & Co.

York.—Electricity Committee. Recommended. Wall system diagram (£237).—A. Reyrolle & Co., Ltd.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, April 20th. Institution, London. 6 p.m. "The Heating of Domestic Pendant Lamp Fittings and their Connecting Leads." Messrs. P. D. Morgan, H. G. Taylor, and W. Lethersich. (*Sheffield Sub-Centre*).—Wednesday, April 19th. Royal Victoria Hotel, Sheffield. 7.30 p.m. "Metal-Clad Switchgear, Automatic Protection, and Remote Control, &c." Mr. H. W. Clothier. (*London Students' Section*).—Friday, April 21st. Institution, London. 6.15 p.m. "The High-Voltage Circuit Breaker and its Competitor, the High-Voltage Fuse." Mr. W. D. D. Fenton.

Association of Mining Electrical Engineers.—(*South Wales Branch*).—Saturday, April 22nd. South Wales Institute of Engineering, Cardiff. 6 p.m. Discussion on H.M. Electrical Inspector's Report, 1931.

Broadcasting and Electricity Consumption

An investigation has recently been made by A. Civita concerning the value of wireless receivers as a central station load, and figures have been prepared showing the annual increase in the electricity consumption of 347 consumers owning wireless receivers in a town of 120,000 population in Central Italy. The analysis shows, says *Elektrotechnische Zeitschrift*, that there was an average increase in consumption of no less than 24 per cent. for the whole group, corresponding to an extra 70 kWh per annum. Of the 347 listeners concerned, 249 or 71.6 per cent. of the total were in the small-consumer class (300 kWh or less per annum, excluding radio). In this group the total increase in consumption due to the wireless receivers was 12,956 kWh on a total of 43,057 kWh, excluding radio, *i.e.*, an increase of about 30 per cent., which is sufficient to modify appreciably the hitherto rather unsatisfactory characteristics of very small consumers from the central station standpoint. The increase in the case of the largest consumers (above 700 kWh per annum) ranged from 4.4 to 11.2 per cent.

According to statistics prepared for the International Broadcasting Conference in Madrid, wireless receivers are used in about 34.5 million households (half in North America and most of the remainder in Europe), and the total consumption for broadcasting purposes amounts to about 1,575 million kWh per annum. A 40-W mains receiver, averaging five hours' use per day, will consume 73 kWh per annum, which agrees closely with the average cited above.

Notes

The E.A.W.

The Gaumont Company has taken a film of the modern Electrical Housecraft School in the new headquarters of the Electrical Association for Women at 20, Regent Street, S.W.1. The film, which is entitled "Motorcraft in the Kitchen," is accompanied by an excellent running commentary, and gives an extremely good demonstration of the functions of several of the most modern domestic appliances. It has already been released, and is on show at several London cinemas.

The ball given by the E.A.W. at the Dorchester Hotel, W., on April 7th, was once more a brilliant and enjoyable function. About 450 tickets were sold, and those present, who were received by Lady Moir (president) supported by Viscountess Elibank, included many of the leading personalities in the electrical industry. An excellent cabaret and other attractions had been arranged. The proceeds from the purchase of tickets for the ball and from the ancillary features will be devoted to the New Premises Fund of the Association.

Appointments Vacant

Installation inspector for Southwark Electricity Department.
Electrical engineer for Holmfirth Urban District Council.
Foreman cable ganger for Ilford Borough Council.
(See our classified advertisements.)

The Generation of Electricity in March

The official returns rendered to the Electricity Commissioners show that 1,160 million kWh was generated by authorised undertakers in Great Britain during March, as compared with the revised figure of 1,091 million kWh in the corresponding month of 1932—an increase of 69 million units, or 6.3 per cent.

In 1933 up to the end of March the total amount of electricity generated by authorised undertakers was 3,647 million kWh as compared with the revised figure of 3,386 million for the corresponding period of 1932, representing an increase of 261 million kWh, or 7.7 per cent.

Mining Electrical Engineers' Dinner

The annual dinner of the Yorkshire branch of the Association of Mining Electrical Engineers was held at Sheffield last Saturday, the president, Mr. H. Watson Smith, presiding. That the mechanisation of mines was increasing rapidly was the opinion expressed by Mr. F. Beckett, the national president, and to get full benefit highly skilled electrical engineers, to supervise the installation of plant and its maintenance, were necessary. By using electricity instead of compressed air the cost of production might be reduced by 6d. per ton.

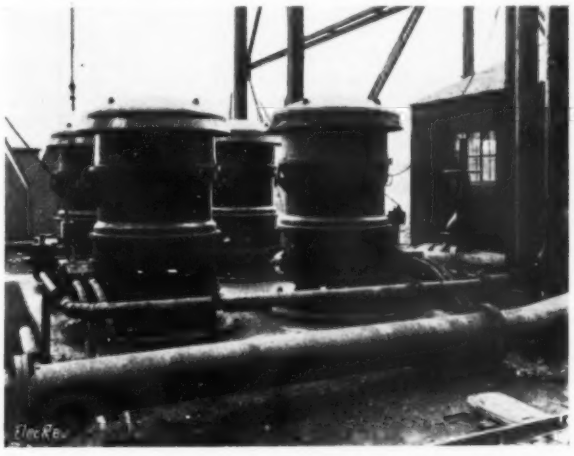
In proposing the toast "Kindred Associations," Prof. R. V. Wheeler declared that according to statistics, accidents in mines that could be traced to electricity were negligible. Mr. John Brass, president of the Institute of Mining Engineers, replying, said that mines could produce electricity even more cheaply than the grid system.

Prof. I. C. F. Statham, Mr. A. C. F. Assinder, president of the Midland Institute of Mining Engineers, Mr. H. L. Crowther, and Mr. C. F. Dyer, president of the Doncaster sub-branch of the Association, also spoke.

Large Direct-starting Motors

Considerable economy can be effected by the employment of simple squirrel-cage motors direct-started from the line. Their use is usually restricted (whether justifiably or no) on public supply networks to machines of a few horse-power in the interests of voltage regulation for lighting consumers. In power stations this consideration does not apply, and motors of up to about 1,000 h.p. have been direct-started. The mechanical shock at starting is less for motors direct-coupled to their loads than with auto-transformer or star-delta starters, except where backlash is present.

As an example of present tendencies, the eighty-five motors, aggregating some 3,700 h.p. and ranging from 0.5 to 280 h.p.,



Totally enclosed Holmes a.c. motors driving ash-handling plant pumps at Dunston

manufactured by Messrs. J. H. Holmes & Co., Ltd., for driving auxiliaries at the Dunston 50-cycle station are all arranged for direct switching on to the line. The duties performed include such diverse drives as those of the sixteen 2.5-h.p. stoker motors, the two 190-h.p. motors for the battery-charging sets, and the three 280-h.p. and three 160-h.p. motors for the ash pumps. These motors are the largest yet made by Messrs. Holmes of the external fan-cooled type. Electric welding has been used extensively in their construction. They operate out of doors with no protection from the weather other than the mushroom-shaped cowls, which also form the exit for the ventilating air which passes through the annular space between the two casings.

An Electrically Welded Ship

On April 12th an electrically welded vessel was launched from the Wallsend yard of Messrs. Swan, Hunter & Wigham Richardson, Ltd. The vessel has a capacity of about 1,000 deadweight tons and is 179 ft. long. It has been built for Canadian owners for service on the Canadian Lakes.

The inauguration of the Blackburn Meadows station, Sheffield (see page 533). From left to right: Alderman W. Walker, the Mistress Cutler, the Lady Mayoress, the Lord Mayor, Councillor J. Green, Prince George, and Mr. E. Morgan (city electrical engineer)

Finsbury Old Students' Dinner

The second informal dinner of the Finsbury Technical College Old Students' Association will take place at Stone's Chop House, Panton Street, Haymarket, on April 27th, immediately after the I.E.E. Kelvin Lecture. Old students who desire to be present should communicate with the hon. secretary, Mr. F. R. C. Rouse, c/o Venner Time Switches, Ltd., Kingston By-Pass Road, New Maldon, Surrey.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Faraday House Awards.—As a result of the entrance scholarship examinations held at Faraday House Electrical Engineering College last week, the following awards have been made by the Governors: Mr. T. V. R. Wilson, the "Faraday" Scholarship of 80 guineas a year for three years; Mr. W. T. Duerdoth, the "Maxwell" Scholarship of 60 guineas a year for three years; Messrs. G. G. Scarrott, D. Kahn, and H. A. Erith, exhibitions of 40 guineas a year for two years; and Mr. C. A. E. Chandler, an exhibition of 30 guineas a year for two years.

Mr. H. E. Blakiston, borough electrical engineer, West Hartlepool, has been granted an honorarium by the Corporation of £250, in recognition of his work in negotiating the agreement between the Corporation and the North-Eastern Electric Supply Co. and the Central Electricity Board. Councillor Green, who opposed the recommendation, said that the scheme, under which the Corporation will cease to generate electricity and take energy from the Supply Co., was a device for making a profit for a private concern in Newcastle. He criticised a proposal to place to a sinking fund £13,200 paid by the Central Electricity Board in lieu of the change of frequency at Seaton Carew Works, which had been closed down, while at the same time it was proposed to borrow £10,000 for new electrical works. Ald. Macfarlane (chairman of the Electricity Committee), in reply, said, with regard to the arrangements with the Supply Co. and the Central Board, the town had made the best financial bargain in its history.

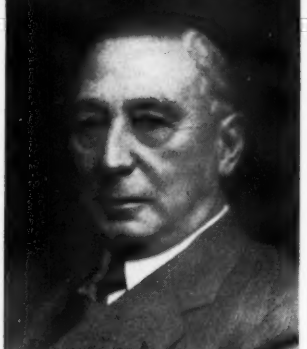
Mr. C. Crampton, joint author with Mr. C. E. Horton, of the paper on "A Radio Compass Developed in H.M. Signal School," which was recently read before the Wireless Section of the I.E.E.

Mr. N. T. Smith, A.M.I.E.E., has been appointed by the Stewartry County Council Electricity Sub-Committee as chief engineer and manager to the County Council under its electricity scheme. Mr. Smith is district engineer and manager of the Bridgnorth, Highley, and Cleebury area of the Shropshire, Worcestershire, and Staffordshire Electric Power Co.

Mr. N. Deykin, for many years Midland representative for Berry's Electric, Ltd., and latterly Midland sales manager, has resigned his position; he intends to visit Canada and the United States. His present address is 193, Station Road, Wylde Green, Birmingham.

Mr. and Mrs. Caines, of Leighton Street, Woburn, celebrated their golden wedding on March 25th. Mr. Caines was for over fifteen years with Cromptons, of Chelmsford, and undertook installations for that company all over the country. Since 1902 he has been electrician at the Duchess of Bedford's Hospital, Woburn.

Mr. W. T. Vernon has been appointed sales manager by Grosvenor Electric Batteries, Ltd. Mr. Vernon was for many years with the Chloride Electrical Storage Co., Ltd., and Britannia Batteries, Ltd.



[Basil, London

Lt.-Col. F. A. Cortez Leigh, who is the author of the I.E.E. paper on the Manchester-Altrincham railway electrification

Mr. H. F. Smith, shift engineer at the Colchester Corporation generating station, has been appointed district manager for Wivenhoe and St. Osyth.

Mr. D. Cleghorn Thomson has resigned his appointment with the British Broadcasting Corporation. A successor will be appointed shortly. The duties of Scottish Regional director will be carried out temporarily, as from May 1st, by Mr. Moray McLaren, at present principal assistant in the Scottish Region.

Prof. F. G. Bailey, M.A., M.I.E.E., has been elected president of the Edinburgh and District Radio Society.

Mr. F. C. Chown has recently taken over the duties of lamp superintendent at the Newcastle office of the Metropolitan-Vickers Electrical Co., Ltd., in succession to the late Mr. E. C. Kilroe. Mr. Chown was previously on the London office sales staff of the company.

Mr. E. H. Skinner, A.M.I.E.E., of Stepney, has been appointed installation and meter superintendent by the Colchester Corporation Electricity Supply Committee.

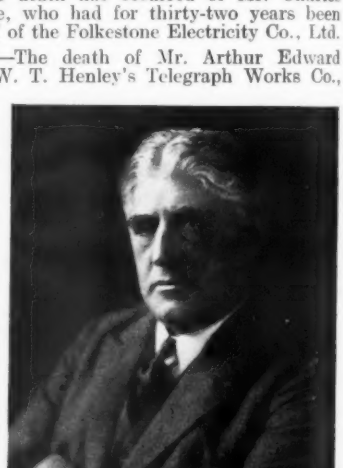
Mr. H. W. Rowell, chief chemist, Ellison Insulations, Ltd., Birmingham, has been elected chairman of the Birmingham and Midland Section of the Society of Chemical Industry.

Obituary

Mr. W. T. Young.—The death occurred on April 5th of Mr. Walter Theodore Young, general manager of the Halifax Corporation Electric Tramways and Transport Department, at the age of fifty-three years, after a fortnight's illness which culminated in pneumonia. Mr. Young had held the Halifax post for the past seven years, prior to which he had periods of service as traffic superintendent at Aberdeen, Oldham, West Ham, and Belfast; assistant manager at Edinburgh; and general manager at Dundee, being five years in the last position before going to Yorkshire. His tramway experience extended over thirty years, and he was a representative of the Tramways Association on the Joint Industrial Council for the industry. He is survived by a widow and three daughters.

Mr. C. Cooper.—The death has occurred of Mr. Charles Cooper, aged fifty-three, who had for thirty-two years been on the engineering staff of the Folkestone Electricity Co., Ltd.

Mr. A. E. Salmon.—The death of Mr. Arthur Edward Salmon, chairman of W. T. Henley's Telegraph Works Co., Ltd., occurred on April 6th at his residence, "Brooksby," Bourne End, Bucks. He had been indisposed, but was in touch with the office by telephone during the morning; he succumbed an hour or two later from heart failure. He was contemplating being in the city in connection with the affairs of the company on the following day. Mr. Salmon, who was sixty-eight years of age, joined Henley's as secretary in April, 1894; he was appointed a director in July, 1926, acting especially in the capacity of financial adviser to the board. He was elected chairman of the company in April last year, when Sir George Sutton, Bt., gave up the active duties of the chairmanship and became president. Mr. Salmon was on the boards of several other companies, principally electrical.



[Int. Rotogravure

The late Mr. A. E. Salmon

The funeral took place at Little Marlow Church on Saturday.

Among the relatives and personal mourners at the interment were: Mrs. Salmon (widow), Mr. Charles Salmon (brother), Mr. E. Groner (nephew), Mr. and Mrs. Unthank, Mrs. Groner, Miss E. Salmon, Mr. C. Rean, Mr. and Mrs. Lionel Walter, Mr. G. A. J. Smallman, Mr. E. A. Smith, and Mr. H. Dutfield.

The following represented W. T. Henley's Telegraph Works Co., Ltd.: Sir Montague Hughman, director; Messrs. R. J. Hatton, director; W. F. Bishop, general manager; A. H. M. Jacob, secretary; P. Dunsheath, technical manager; J. F. Colyer, contracts manager; W. H. Nichols, engineering manager; F. Anderson, sales manager; B. C. Wilkins, accountant; J. E. Bradfield, delivery service manager; D. I. Evans, buyer; A. H. Foster, cashier; J. A. Bunting, power cable sales manager; W. A. Moore, advertising manager; F. J. Bettley, registrar; Miss Gilbert, chairman's private secretary; Messrs. E. J. Pond, Midland District representative; T. H. Smith, L. Smith, N. O. Walker, Miss Spain, Miss Jerman; Mr. E. Lefeaux, manager, Woolwich Works; Messrs. A. W. McArthur, assistant manager, Woolwich Works; H. J. Hodges; C. Walker; F. C. Jennings, works chief engineer; C. Harris; H. Gale; Mr. R. O. Wright, manager, Gravesend Works, and Mrs. Wright; Messrs. E. Judge, assistant manager, Gravesend Works; W. F. E. Smith; L. Sed; and W. C. Barry, chief research officer. Sir George Sutton was prevented from attending owing to a slight indisposition.

Henley's Tyre & Rubber Co., Ltd., was represented by: Messrs. J. Traxler, managing director; Miss M. Fish, assistant manager; W. G. Smale, secretary; S. J. Madden, sales manager; A. W. Ray, accountant; F. J. Paveley; H. Stanley, service manager; F. Hatfield; G. Ragg; H. S. Henley; E. Warwick.

Others present were: Messrs. Ll. B. Atkinson, Cable Makers' Association; J. H. Roberts, secretary, Cable Research; A. H. Selwyn, production officer, Cable Research; E. Reeves, manager, Power Holdings, Ltd.; J. Snow Huddleston, managing director, Union Cable Co.; Johnstone Sinclair, director, British Insulated Cables, Ltd.; A. B. Collins, Enfield Cable Co.; Ernest Leete, L.E.W. Co. & Smiths; W. J. Terry, Liverpool

Cable Co.; E. M. Malek, Callender's Cable & Construction Co., Ltd.; Gerald Addison, Linklaters & Paine; F. N. Gamidge, Ball, Baker & Co.; Joseph Hall, chairman, North Somerset Electric Supply Co., Ltd.; Frank Christy, M.I.E.E., director, North Somerset Electric Supply Co., Ltd.; Ernest W. Tole, secretary and manager, North Somerset Electric Supply Co., Ltd.; Henry Savage, ex-Woolwich works manager; Wilfrid Lefeaux; and F. J. Bostridge, Cable Research.

A memorial service was held at the Church of St. Sepulchre, Holborn Viaduct, on Tuesday afternoon. This was attended by about 700 people, including many prominent electrical men.

In consequence of Mr. Salmon's death, the staff dinner, which was to have taken place at the Wharncliffe Rooms on Saturday, was cancelled.

Mr. G. F. Shaw.—The death occurred suddenly on March 29th, at the age of forty-nine years, of Mr. George Frederic Shaw, of Crowther & Shaw, electrical engineers, of Market Street, Huddersfield.

Mr. R. L. Jenkins, A.M.I.E.E., died on April 9th at Clifton, Bristol, aged fifty. He had held staff appointments with Bristol Corporation Electricity Department and the North-Eastern Electric Supply Co., Ltd. Of recent years he had been engaged in electrical business in Bristol.

Herr W. Schäffer.—The death of Herr Walter Schäffer in his fifty-second year is announced from Berlin. As chief engineer of the Reichs-Rundfunk Gesellschaft, Herr Schäffer took a prominent part in the technical deliberations of the Union Internationale de Radiodiffusion, and was well known in communication circles for his achievements in radio engineering, high-frequency technique, and acoustics. A man of charming manner and great technical talents, he had a large number of inventions to his credit. Before turning to broadcasting, he was associated with the Telefunken Co. and was responsible for the introduction of many improvements into the German airship service, to which he was attached during the war.

Mr. D. A. Connors.—Mr. David Andrew Connors, of Tonbridge, who was for forty-two years on the electrical engineering staff of Drake & Gorham, Ltd., died recently.

Wills.—Mr. H. H. Wiggin, formerly a director of Henry Wiggin & Co., left £91,935 (net personalty £76,618).

Mr. Frank Graham, electrical engineer, of Ladbroke Gardens, W., left £13,207 (net personalty £12,560).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Exide Services, Ltd.—Private company. Registered April 6th. Capital £100 in £1 shares. Objects: To acquire from the Chloride Electrical Storage Co., Ltd., a licence to use certain trade marks and to carry on the business of makers of and dealers in electrical and chemical appliances, &c. The first directors are: W. S. Naylor, 44, Park Road, Pendleton, Manchester; and D. P. Dunne, 173, Victoria Street, S.W.1 (both directors of the Chloride Electrical Storage Co., Ltd.). Secretary: C. M. Mills. Registered office: Clifton Junction, near Manchester.

Cromwell (Southampton), Ltd.—Private company. Registered April 7th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio, television and gramophone apparatus, &c. The directors are: Harry Dibben, "Heather Hill," Chilworth, Hants; and two others. Registered office: 32 and 33, Brinton's Terrace, Southampton.

Haylett Bros., Ltd.—Private company. Registered April 5th. Capital £1,500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio, television, telephone and telegraph instruments or apparatus, gramophones, &c. The permanent directors are: R. H. Haylett, 13, Lacon Road, Caister-on-Sea, Norfolk; and F. D. Haylett, 4, Garfield Terrace, Yarmouth Road, Caister-on-Sea.

Kenden, Ltd.—Private company. Registered April 6th. Capital, £1,000 in 250 5 per cent. preferred ordinary and 750 ordinary shares of £1 each. Objects: To carry on the business of wire and insulator manufacturers, electrical, mechanical and general engineers, &c. The permanent directors are: C. Fonteyn, 74, Duke's Avenue, Chiswick, W.4; and F. H. Bennett, The Corner House, Smitham Downs Road, Purley. Registered office: 34, London Wall, E.C.

H. & K. Radio Services, Ltd.—Private company. Registered April 6th. Capital, £2,000 in 300 6 per cent. cumulative preference and 1,700 ordinary shares of £1 each. Objects: To carry on the business of radio engineers, &c. The subscribers are: V. H. Holding, 38, Nightingale Square, Wandsworth, S.W.12; and W. W. Fay, 34a, Barons Court Road, West Kensington, W.14. S. F. Bandy, 29, Wymering Mansions, Maida Vale, N.W., is to be one of the first directors. Registered office: 4, The Parade, Kilburn, N.W.6.

W. S. Watson, Ltd.—Private company. Registered in Edinburgh on April 3rd. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, mechanical and general engineers, &c. The directors are: W. S. Watson and Mrs. Eleanor Watson, both of 119, Kingsheath Avenue, Rutherglen. Registered office: 152, Gorbals Street, Glasgow.

Durant & Willitts, Ltd.—Private company. Registered April 6th. Capital, £500 in £1 shares. Objects: To acquire the business now carried on at 37, Livery Street, Birmingham, as "Durant & Willitts," and to carry on the business of electrical, wireless, telegraph, mechanical and general engineers, &c. The directors are: F. L. Willitts, 126, Hazelhurst Road, King's Heath, Birmingham; and C. F. Durant, 289, Olton Boulevard West, Acocks Green, Birmingham. Solicitors: Leslie J. Biddle, 36, Bennett's Hill, Birmingham.

Suflex, Ltd.—Private company. Registered April 5th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers, exporters and importers of and wholesale and retail dealers in insulation tubes and wires for the electrical and wireless industries, &c. The directors are: B. Hornung, Brent Bridge Hotel, Barnet, Middx; G. Marks, 86, Woodlands, Golders Green, N.W.11. Solicitors: Cochrane & Cripwell, 119, Finsbury Pavement, E.C.

Returns of Electrical Companies

Davies, Kent & Stewart, Ltd.—Capital, £3,500 in 2,500 preference and 1,000 ordinary shares of £1. Return dated December 28th, 1932. 1,974 preference and 1,000 ordinary shares taken up. £2,974 considered as paid. Mortgages and charges, £1,350.

Melbourne Electric Supply Co., Ltd.—Capital, £1,750,000 in 150,000 8 per cent. 1st preference shares of £5 and £1,000,000 consolidated ordinary stock. Return dated December 21st, 1932. 100,000 preference shares and £800,600 ordinary stock taken up. £1,286,445 paid on 100,000 preference shares and £786,445 ordinary stock. £14,155 considered as paid on £14,155 ordinary stock. Mortgages and charges, £1,775,188.

Matthews Electric Signs, Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1932. 1,512 shares taken up. £909 10s. paid (£1 per share on 2 and 15s. per share on 1,210 shares). £300 considered as paid on 300 shares. Mortgages and charges, nil.

Cattley Accumulator Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 30th, 1932. 2,350 shares taken up £1,900 paid. £950 considered as paid. Mortgages and charges, nil.

New Phonopore Telephone Co., Ltd.—Capital, £10,000 in 9,000 ordinary and 1,000 founders' shares of £1. Return dated January 13th, 1933. 7,141 ordinary and 1,000 founders' shares taken up. £6,741 paid on 6,741 ordinary shares. £1,400 considered as paid on 400 ordinary and 1,000 founders' shares. Mortgages and charges, £2,666 13s. 4d.

C. A. Parsons & Co., Ltd.—Particulars have been filed of debentures to secure £431,125 authorised March 29th, charged on the company's undertaking and assets, present and future, the whole amount being now issued.

Neonbar Signs, Ltd.—R. A. P. Barton, 1, Albert Road, Wimbledon Park, S.W., was appointed receiver and manager on March 30th under powers contained in debenture dated February 23rd, 1933.

City Notes

Associated Electrical Industries, Ltd., held its annual meeting on April 7th, Sir Felix J. C. Pole (chairman) presiding. Before dealing with the report and accounts the chairman referred to the imprisonment in Russia of a number of the Metropolitan-Vickers Electrical Co.'s engineers. He said that the company was satisfied that a grave mistake had been made. Their engineers had most positive instructions that they must concern themselves only with the Metropolitan-Vickers Company's work, and be scrupulously careful not to take part in political or other controversy affecting the Government of the U.S.S.R. He had no reason to doubt that they faithfully observed these instructions. The Metropolitan-Vickers Co. had arranged for its legal advisor, Mr. R. R. J. Turner, to proceed to Moscow in order to be present at the trial which it was stated would commence on April 10th, and Mr. Monkhouse had been authorised to exercise whatever rights there were in Russia in respect of the employment of a barrister or barristers for the defence. Their business dealings with Russia extended over more than ten years and hitherto the Metropolitan-Vickers Co. had had most satisfactory relations with the representatives of the Russian Government here and in Moscow. Work for the U.S.S.R. had given employment to a large number of men at the Trafford Park works.

Passing to the activities of the A.E.I. group, the chairman said that public reference to the work of the B.T.-H. Co. and the Edison Swan Co. had been made at the respective meetings of those companies. As regarded the Metropolitan-Vickers Co., although the general depression was reflected in a decreased demand for heavy plant, particularly large turbo-alternators, the company received a fair share of such orders as were placed. Foremost among them was an order for two 60,000-kW sets for the Fulham Corporation for a new super power station. Another notable order was for a 24,000-kW, 3,000-r.p.m. turbine to work at a steam pressure of 1,778 lb. per sq. in., and a maximum continuous temperature of 932 deg. F., and exhausting at a pressure of 380 lb. per sq. in. Their design had been selected in international competition. Two 20,000-kW sets for North Tees had been reconstructed to make them suitable for 50-cycle supply. A 67,000-kW turbo-alternator for Battersea was completed, and two more 32,500-kW sets for the Victoria Falls Company had been put into operation. For the same company they supplied three 20,000-kVA synchronous condensers which were the largest machines of the kind built in this country. The forty four-coach units for suburban service on the Southern Railway were completed and put into operation. They had supplied 968 equipments to the Southern Railway Co. A number of important orders were received for railway signal apparatus, including contracts for all-electric interlocking and colour-light signals for the Great Western Railway. They were also proceeding with the Euston to Watford installation of colour

light signals for the London, Midland & Scottish Railway Co. In all their departments there had been marked development and progress. The adverse trading conditions, particularly overseas, continued throughout the year, and the order-book at the end of the year was considerably lighter than at the end of 1931. The immediate outlook was not reassuring; export trade was still impeded by financial and exchange complications in many countries, while world trade was still disorganised by the low prices of primary commodities. Export trade had fallen considerably, not only in foreign countries but in many parts of the British Empire. At home orders for lighter types of apparatus were keeping up fairly well, and should continue to do so bearing in mind the continued increase in the consumption of electricity. The country had reached the stage where it had a very cheap and abundant supply of money, which ultimately must have a salutary effect on our trade. The Government and local authorities could not choose a more favourable time than now to embark on schemes of reproductive capital expenditure. The passing of the London Passenger Transport Bill should also affect considerably the activities of their companies, as they knew that schemes of electrification of suburban railways had been held up pending the passing of the Bill. Railway electrification was a branch in which they had specialised for many years and they were fully equipped to deal with a large volume of work. Sir Felix referred to the suggestion made by Mr. W. C. Lusk at the B.T.-H. Company's meeting that it was worth considering whether a suitable body could be set up for the purpose of co-operating with the leading companies of the electrical industry with the object of finding a suitable way of dealing with the question of excess manufacturing facilities, and said he hoped that Mr. Lusk's suggestion would be considered most earnestly by electrical manufacturers.

The International Automatic Telephone Co., Ltd., held its annual meeting on April 6th, when Sir Alexander Roger (chairman), who presided, said that the company's substantial holdings in, and loans to, the Telephone & General Trust, Ltd., served the dual purpose of securing a satisfactory investment and obtaining manufacturing business from telephone operating companies for the Automatic Electric Co., Ltd. The Trust was one of the few companies of this class, the market value of whose quoted securities was in excess of the book value. The manufacturing business secured by the company through the Trust amounted to a substantial figure. Referring to the activities of the Automatic Electric Co., Ltd., he said that in the home market the principal achievement was the successful completion of the "Mayfair" contract, covering the installation in one building of three automatic telephone exchanges having an ultimate capacity of 30,000 lines. This was believed to be the largest individual order ever placed by the Post Office. The cost of the Mayfair Exchange exceeded £500,000, provided employment for some thousands of people, and took about fourteen months to install. The installation of other exchanges, automatic and manual, of various capacities both for London and the provinces has also been carried out to the order of the Post Office, and they had been awarded the contracts for the supply and installation at Bristol, Nottingham, Birmingham, and Manchester of their "no-delay" equipment. Their export business had been well maintained and during 1932 orders were received from no fewer than thirty-six countries. The first stage in the contract with the South African Post Office for the automatisation of the Johannesburg area was successfully completed on March 26th last. Satisfactory progress had been made with the supply of "Strowger" equipment to the Post and Telegraph Administration of Poland. Three exchanges were in course of erection, and it was anticipated that a further twelve would be completed and cut over during the current year. Other overseas contracts dealt with included the supply of telephone and telegraph apparatus for the communication scheme in connection with the Iraq Petroleum Co.'s pipe line across Palestine, Iraq, and Syria. Since the introduction of the "Electromatic" traffic system by the Automatic Electric Co. contracts had been secured for upwards of 150 installations, including Piccadilly and Trafalgar Square in the London area. The popularity of the system had extended to many European and Empire capitals where installations were now in progress, and the prospect of its adoption in many places in other countries was encouraging. As to the future, while there were not sufficient grounds on which to found an expectation of an early betterment in trading conditions, particularly abroad, there was no reason why they should not continue to expect a considerable amount of business. It was gratifying to know that the Post Office had embarked on a campaign of commercial activity for the greater expansion of the telephone system, and the recent announcement of the Chancellor of the Exchequer that he had given his approval to proposals for speeding up the substitution of automatic exchanges for manual exchanges was also of interest to them.

The English Electric Co., Ltd., held its annual meeting on April 11th, Mr. G. H. Nelson (deputy chairman and managing director) presiding. In presenting the report and accounts (Elec. Rev., April 7th, p. 509), the chairman said that taking into consideration the difficulties which hampered trade during 1932 throughout the world, together with the fact that at home municipal and other public authorities had curtailed development and postponed capital expenditure, the results for the year could not be considered altogether unsatisfactory. They were satisfied that the Company was now so organised that it would be in a position to take immediate advantage of any improvement in trade. Dealing with the balance sheet, Mr. Nelson said that capital expenditure showed an increase of £69,879 due to additions to buildings, plant, machinery, &c., and most of these additions were in connection with the manufacture of new lines of apparatus and domestic heating and cooking appliances. Amongst the contracts received during the year was an order from the Galloway Power Co. for water-turbines and auxiliaries, representing over 32,000 h.p. They also received an order for the complete electrical equipment for a continuous rolling mill for the Lancashire Steel Co. The British Broadcasting Corporation not only gave them repeat orders for their h.t., d.c. equipment, but, in addition, placed with them an order for four Diesel-alternator sets.

The traction side of their business had been fairly well occupied during the year, mainly for equipments for railways and tramways overseas. At home this business had been nearly at a standstill. In their vehicle body shops they had extended their range of manufactures to road coaches and railway rolling stock, and in connection with the latter had received orders for the new railway in Bermuda. They had secured in face of severe international competition, the order from the Danish State Railways for the electrification of the Copenhagen suburban lines, and had also been entrusted with a repeat order for rolling stock equipment for the Madras suburban electrified lines of the South Indian Railway. Both these electrifications were at 1,500 V d.c. overhead, which coincided with one of the proposed standard voltages for the electrification of British railways. Their works were well equipped to meet future demands that might arise when the extension of electrification of British railways was embarked upon.

The turbo-alternator business was practically at a standstill, but their general business had been maintained and orders had been executed for transformers, switchgear, rotary convertors, industrial motors (including fractional h.p.), and fusegear. Their heating and cooking department was making the progress anticipated. The exhibition of their new lines of manufacture and work in progress at the Stafford works attracted nearly 1,000 prominent engineers and should help in receiving at least a proper share of business as trade improved. They had secured their full share of such business as had been available. The key to their position, and the main cause of uncertainty as to the future, lay in the serious shrinkage in the volume of business placed. From 1924 to 1929 their export business averaged 52 per cent., and in one year 61 per cent. of their total turnover, but during the last three years their exports represented no more than 31 per cent. of their turnover. Exchange restrictions and prohibitive tariffs were obstacles round which there was no short cut, and there was nothing they could do, as a company, to reopen old markets or discover new ones. There was some ground for hope that through the revival in other industries which stood to benefit more than theirs by the Ottawa agreements, their industry might indirectly also benefit. The low level of prices prevailing for heavy electrical plant was due to additions to the already excess manufacturing capacity by new manufacturers coming into the business and forcing price levels down in an endeavour to establish themselves, and to manufacturers in the industry adopting the policy of quoting very low prices in an attempt to maintain their order books at normal level, despite the fact that the total volume of business available was not normal; vicious price-cutting was the result.

As to the future, apart from the conditions in foreign markets, there were in this country no appreciable signs of improvement in the electrical industry. The requirements of the grid being largely fulfilled, skilled men who were engaged on this work were already unemployed, and the Government, municipal and other large bodies, who had postponed expenditure of a sound character, might now reasonably be called upon to adopt a policy of prudent spending and so help to bring into employment that body of skilled men on whom the future prosperity of this country so greatly depended. A survey of the first three months of 1933 unfortunately showed no improvement in this direction.

The Brompton & Kensington Electricity Supply Co., Ltd., held its annual meeting on April 6th. Mr. H. R. Beeton (the chairman), who presided, in presenting the report and accounts (Elec. Rev., March 31st, page 473), said that owing mainly to the consolidation of generation by the nine London companies in 1925 their electricity last year cost them nearly 10 per cent. less per kWh than the year before, and they were able to sell 16 per cent. more at a reduction of nearly 10 per cent. in their average price. On analysis, this position was largely attributable to the development of the domestic demand. Whereas in 1926, when the standard price under the sliding scale came into operation, their average price was nearly 5d. per kWh, in 1932, to which the new standard price when fixed would apply, it was less than 2½d. per kWh. Thus in six years their average price had been halved, and those customers who adopted the two-part tariff last year consumed on an average 3,514 kWh at an average all-in price of about 1½d. per kWh, while those who remained on the flat rate charges of 5d. and 1d. consumed on an average only 792 kWh at an average price of over 3d. per kWh. Under the new standard price the hope of "additional dividend" lay in obtaining a large extension of "off-peak" load with a corresponding larger and cheaper supply of electricity from selected stations through the operation of the grid. The extension of the "off-peak" load required intensive local salesmanship, with showrooms, on the part of the distributor, and at the same time a large and sustained expenditure throughout the country for the general advertisement of the domestic uses of electricity. A system of national publicity for spreading a knowledge of the benefits available from an extended use of electricity was called for. For this we might reasonably look to the Central Electricity Board and to the British Electrical Development Association, whose energetic and efficient organisation deserved the fullest support of all concerned in the electrical industry whether supply authorities, manufacturers of apparatus, or cable makers. It was to the combined effect of increased diversity of demand and more economical supply from selected and interconnected stations that they looked in course of time for the justification of the sliding scale.

A. Reyrolle & Co., Ltd., held their annual meeting on April 4th, Sir Arthur N. L. Wood (chairman) presiding. In presenting the report and accounts (Elec. Rev., March 31st, p. 472), the chairman said that the report stated that the orders received during 1932 showed a reduction. In point of fact the reduction was very considerable, and as they could not see any great improvements at the moment the results of the reduced turnover would in due course be reflected in the accounts. They had been able to share in the large orders for switchgear which had been placed by the Central Electricity Board, including those for the Dunston power station and sub-stations connected therewith. These orders had been completed to a large extent and they could not at the moment look forward to work of a corresponding amount to take their place. They

recognised the great advantage which electrical manufacturers had had in the large amount of work placed in connection with the Central Board's schemes, which had kept the works fully employed for several years, but they must now expect a smaller amount of work until a general improvement in trade called for further expenditure by municipal electricity undertakings and electric power companies, and when the mines and factories were able again to increase their output. They continued to receive a considerable proportion of the work which was in the market and also a fair amount of export business. There had not been quite such a large reduction in overseas orders as there had been at home. Their manufacturing arrangements with foreign licensees continued to be satisfactory, but they had evidence of the smaller amount of business abroad in the reduced royalties which they had received during the year. They had entirely redesigned the Holmes motors and had also set to work a department for the manufacture of vacuum cleaners. These were marketed by the Eureka Vacuum Cleaner Co., and in spite of the distressed times the demand was continually growing. They had proved by means of the short-circuit testing plant installed at the works three years ago the sound construction of their metal-clad circuit breakers. This plant was the only one of its kind in this country, and its capacity for short-circuit tests was greater than any in the world. As manufacturers of capital goods they would welcome a policy of reasoned national expansion. A reduced demand meant a smaller labour force, and it was with the greatest regret that they had had to dispense with the services of some of their employés. In the meantime they were working hard to find new outlets for their productive capacity.

Ericsson Telephones, Ltd., held its annual meeting on April 5th. Col. Sir Harold A. Wernher (chairman), who presided, in presenting the report and accounts (Elec. Rev., March 31st, p. 473), said that their satisfactory position was due, in part, to continued effort to widen their field of productions. Their police signalling system had aroused keen interest among police authorities throughout Great Britain. In this business they were co-operating with the General Post Office, from whom they had already received orders, and others were expected shortly. The department for the manufacture of cellulose enamels and wood finishes had done very well during the year. Since the passing of the Racecourse Betting Act in 1928, they had carried out, in collaboration with their subsidiary company, a number of important contracts for the Racecourse Betting Control Board. Later they turned their attention to greyhound racecourses, and had built up an important business in this field. Much work was obtained for their factory until an unexpected interpretation of the existing law was given on appeal in the High Court in December last, which immediately put a stop to this industry. It was hoped that new legislation in the near future would set the position right. In the field of telephone apparatus they were able to maintain their position. The number of new automatic telephone exchanges opened during the year was sixty-seven, excluding small rural exchanges, a number of which were manufactured by them. The number of telephone stations in this country increased by 70,000 during the year, bringing the total telephones connected to the public system at the end of 1932 to approximately 2,133,000. Although trade conditions were depressing, the outlook for 1933 was not without promise, and so far as could be judged from the results to date, the work at present in hand, and prospective orders, they looked forward to presenting a satisfactory report at next year's meeting.

The Chelsea Electricity Supply Co., Ltd., held its annual meeting on April 6th. Mr. W. R. Davies (chairman), who presided, said the net income was barely sufficient to pay the statutory dividend, the reason being the charge of £20,625 for rates. They intended to appeal again what they considered a gross overcharge, but the appeal was deferred until a pending appeal to the House of Lords was decided, as to whether stautory deductions for sinking funds should be allowed as a working expense. The Chelsea Borough Council had complained that their charges (maximum for lighting 5d. and for power 1½d.) were too high. The reason they could not reduce their price was the heavy burden of rates, which, compared with those of certain other London companies, were double what they should be. There were hundreds of their consumers in houses and flats who, under a two-part tariff, obtained electricity at well under 3d. per kWh, and in a number of cases the price was well below 2d. Their business had made steady progress and they could look forward to the future with confidence.

John Ismay & Sons, Ltd.—An issue at par of 90,000 6½ per cent. cumulative preference shares of £1 each and 90,000 ordinary shares of 1s. each was offered for subscription last week. The prospectus stated that the company has been formed to acquire as a going concern as from December 31st last and to develop and extend the business of B.I.M., Ltd., manufacturers of electric lamps and incandescent gas mantles. The vendor company originally manufactured gas mantles only, but late in 1931 added the manufacture of electric lamps. Additions and alterations have been made to the works at Roden Street, Ilford, which it is estimated will more than double the present output of the electric lamp department. The extensions should be ready for production by the end of May next. In addition to the usual domestic lamp, the factory is now producing automobile traction and speciality lamps.

The General Electric Co. (New York) reports a total income for 1932 of $14,718,456, as compared with $41,390,229 in the preceding year. From this are deducted interest payments ($314,346), 6 per cent. cash dividends on special stock ($2,575,032), and cash dividends on common stock ($15,864,157, against $46,150,256), leaving a deficit for the year of $4,035,079. The report states that orders received during the year decreased by 52 per cent. to $121,725,772, and that unfilled orders at the end of the year were $20,142,000 (against $49,308,000).

Madras Electric Tramways (1904), Ltd., reports a gross profit of £34,524 for 1932, and after deducting interest, &c., and transferring £11,000 to depreciation and renewals account, there is a balance of £11,448, which with £7,051 brought in makes £18,499. The ordinary dividend is 5 per cent., and £7,936 is carried forward. Receipts showed an increase of 4.2 per cent. as compared with 1931, and the number of passengers carried increased by 4.9 per cent.

The International Aluminium Co. reports a profit of £52,625 for 1932 (against £52,678 in 1931), to which is added £15,473 brought in. The preference dividend is paid and £16,071 is carried forward. The report states that the demand for aluminium fell off, in consequence of which the output of the subsidiary in Norway had to be further reduced. The subsidiary, however, made a small profit.

The Mansfield & District Tramways, Ltd., reports a balance at credit of the revenue account for 1932 of £2,854, and after deducting debenture and loan interest, a balance of £87 is carried forward. An extraordinary meeting is to be held at which a resolution will be submitted changing the name of the company to Mansfield District Omnibus Co., Ltd., as the tramways have now been abandoned.

The British Engine Boiler & Electrical Insurance Co., Ltd., reports that an interim dividend of 15s. per share, less tax, has been paid, and after transferring £25,000 to the pension fund and £12,000 to reserve, there is a balance of £23,803. It is proposed to pay a final dividend of 15s. per share, less tax.

The Keswick Electric Light Co., Ltd., reports a net revenue for 1932 of £3,904 (against £3,121 in 1931). The final ordinary dividend is 6 per cent., making 10 per cent. for the year (against 8 per cent.), and £362 is carried forward.

The Calcutta Electric Supply Corporation, Ltd., proposes to pay a final dividend on the ordinary shares of 7 per cent. (actual), making a total of 12 per cent. for 1932; also a bonus in cash of 2d. per share, both less tax at 2s. 6d.

The Beauharnois Power Corporation, Ltd., has published details of a scheme of reconstruction which is to be submitted to a meeting of the holders of the thirty-year 6 per cent. collateral trust sinking fund bonds, on May 3rd, in Montreal.

The West London & Provincial Electric & General Trust, Ltd., has declared a final ordinary dividend of 1½ per cent., less tax, making 3 per cent. for the year (against 5 per cent.).

The Direct Spanish Telegraph Co., Ltd., has recommended a dividend of 6 per cent., less tax, on the ordinary shares for 1932.

The Torquay Tramways Co., Ltd., has declared a final dividend of 4 per cent., making 8 per cent. for the year (against 9 per cent.).

Joseph Lucas, Ltd., have declared an interim dividend of 5 per cent. on the ordinary shares (same).

Stocks and Shares

Monday Evening.

THE general tendency of Stock Exchange prices can fairly be described as steady, while, with regard to business, there has been more trade about during the past week than is usual to the period that immediately precedes Easter. For this the principal reason is the constant accumulation of cash for which employment is sought by those to whom the deposit rates given by the banks offer no temptation. It would appear as though almost each successive week sees a further strengthening of gilt-edged stocks and shares—a strengthening that spreads automatically, or inevitably, into the ordinary shares of electricity supply companies such as those included in the London group. Investment is beginning to take a lively interest in the forthcoming issues of the London Passenger Transport Board, and estimates are being made of probable prices at which the stocks will come to market when dealings in them begin.

Electricity Supply Shares

Shares are still to be obtained in some of the London electricity supply companies, although the amount on offer is now comparatively small. The shares pay about £4 3s. per cent. on the money—assuming, of course, maintenance of the 7 per cent. standard dividend that applies to the majority of the companies. Hopefulness has, however, begun already to canvass the possibilities of an increase upon this 7 per cent. standard rate in respect of the present year. Last year—1932—was the first during which the provisions of the Act applied, and, this being the case, it was hardly likely that any change would be made, seeing that neither the companies nor their customers quite knew how the arrangement would work. The current twelve months should provide ample opportunities for the companies to see how they stand under the 7 per cent. scheme. It may be considered optimistic to look for an increase in the dividends so soon after the Parliamentary scheme has come into operation, but there are, it may be repeated, people who think that the present year will provide 7½ per cent. for the proprietors of the ordinary shares. As to this, however, only time can show what will happen.

Metropolitan Electric ordinary have risen to 50s., and amongst the provincial shares, Electric Distribution of Yorkshire, which, like Yorkshire Electric Power shares have lately been increasingly popular, are 9d. up to 45s. 9d. The Woking Electric Supply Company has issued an excellent report, maintaining the previously paid dividend of 10 per cent. tax free on the capital, increased as the latter was by the distribution of 37½ per cent. in ordinary shares last year. Bournemouth and Poole ordinary have advanced to 3¼. Newcastle and District ordinary are harder at 32s. 6d.

Madras Electrics at 37s. 6d. are ⅛ to the good.

Cables and Wireless

The feeling of disappointment induced by the fact of there being no dividend paid on Cables & Wireless 5¼ per cent

preference at the end of March, the due half-yearly date, is still felt to some extent, but prices are harder, and a rise of 2 points in the 7½ per cent. "A" ordinary has raised the quotation to 28. Speculative interest in this market has died down a good deal of late, possibly because people are dealing more freely in South African and other mining shares. Reflection of the strength in Kaffirs is to be seen in a rise of ⅛ in Victoria Falls ordinary, which has lifted the price to 4¼. In the other cable stocks, Great Northerns at 28½ are 30s. up, and Anglo-American deferred at 24½ shows a gain of 10s. A gain of 6d. has made Marconi Marines 28s. 9d.

South Americans and Mexicans

Interest has been greatly intrigued by the sharp variations of sentiment in regard to the relations between the Argentine Republic and this country. The delegation that has been visiting London, headed by the Vice-President of the Argentine Republic, was expected to accomplish great things in the way of smoothing out difficulties that prevail, more especially in connection with exchange, and of re-establishing better business relationships between the two countries. This desirable end seemed to have been reached until a week ago, when, on a sudden, it was announced that grave difficulties had developed, and that the Mission might have to return to its country without having achieved any practical good. Another turn in the wheel came almost immediately afterwards, and Argentine stocks, which had been severely depressed, made prompt recovery. Anglo-Argentine Tramways, dormant for months past, have begun to show a spark of vitality, although no changes have occurred in the nominal prices of the issues. Of the Brazilian shares, Brazilian Tractions strengthened to 9⅜. Amongst Mexicans, the outstanding feature is a drop of 9 points in Mexico Tramway 5 per cent. bonds, lowering the price to 32½. This follows the fall of 7½ points in Mexico Light and Power first bonds that occurred last week.

London Passenger and Transport Stocks

As already observed, investment is taking a good deal of interest, in the probable opening prices at which stocks in the London Passenger Transport Board will commence in the market. Full details have already been published of the amounts to which the various stocks and shares in the existing companies will become entitled, and it is not difficult from this to work out what the corresponding stock should stand at, taking, that is to say, to-day's quotations as a basis of value. The prior-charge stocks of the new London Passenger Transport securities, with the exception of the "C" stock, should command prices about the same as those current to-day for similar issues. The 4½ per cent. T.F.A. stock should be, for instance, about 109, the 4½ per cent. "A" stock ought to stand about 112, the 5 per cent. "A" stock at 120, and the "B" about 115. The relative price of the "C" stock, judged by the quotations for the stocks and shares which will receive this stock when the plan goes through in exchange for existing holdings, is about 66. The "C" stock is entitled to 5 per cent. dividend at first, then to 5½, rising to a maximum of 6 per cent. It is fair to assume that the stock, if it were to be distributed to-day, might not get the full 5 per cent. to which it is entitled.

The Speculative "C" Stock

Some time must elapse before this dividend becomes earned, although in due course there is every probability of the 5 per cent. being distributed, in which case the stock will be worth somewhere between 90 and 100. For this reason, the speculative investor is turning his attention to the ordinary shares of the tramway companies that will receive the "C" stock. Underground Electric Railways ordinary shares, and the ordinary stocks of the Central London, City & South London, London Electric and Metropolitan District, will be given "C" stock in exchange for the existing securities. The preference and the ordinary shares of the Metropolitan Electric Tramways and the London United Tramways companies will also receive their proportion of the "C" stock, in which it will be obvious speculation has fairly wide scope for imagination. This week, prices are quiet, with no outstanding feature. London United Tramways debenture, together with London & Suburban Traction preference, hold their previous advances.

Manufacturing and Equipment

Associated Electrical Industries ordinary shares have gone back to 16s. 3d., despite the maintenance of the dividend previously paid of 4 per cent. This was, in point of fact, quite up to expectations, but speculation has evaporated from the market, and money is being employed in mining shares. For the same reason, General Electric ordinary gave way to 40s. English Electric ordinary, after the heavy fall of last week, rallied to 7s. 6d., the preference to 11s. 3d. Ever-Ready shares are a better market at 28s. 9d. The drop in Babcock & Wilcox, due to apprehensions as to a possible cut in the dividend, brought in support at the lower levels, and the price recovered to 33s. 9d., showing a gain of ⅛ on the week. Vickers, after being down to 5s. 9d., rallied to 6s. 3d. The iron and steel market is firm as a whole. Rubber shares are disposed to be a shade harder upon the recurrence of talk as to the necessity for putting commodities on to a higher level, and of the faint improvement in prices which followed upon the suggestion.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1930.	1931.	Price, Apl. 10.	Rise or Fall.	Yield. p.c. £ s. d.
Bournemouth and Poole	1	15	15	73/9	+6d.	4 1 4
Brompton Ordinary	1	8½	8½	33/6	—	4 3 7
Central Electricity 4½% Deb.	Stock	4½	4½	108	—	4 3 4
Charing Cross Ordinary	1	8½	8½	33/6	—	4 3 7
Chelsea	1	8½	8½	33/-	—	4 4 10
City of London	1	10	10	33/6	—	4 3 7
Clyde Valley	1	8	7	35/-	—	4 0 0
County of London	1	11	10½	53/9	—	3 18 8
Edmundsons' 7% Pref.	1	7	7	30/6	—	4 11 10
Elec. Dis. Yorkshire	1	9	9	45/9	+9d.	3 18 7
Elec. Supply Corporation	1	11	11	66/3	—	3 6 8
Kensington Ordinary	1	8	8	33/-	—	4 4 10
Lancs. Light and Power	1	6½	7	32/6	—	4 6 2
London & Home Counties 4½% Deb.	Stock	4½	4½	108	—	4 3 4
London Electric	1	9	9	32/6	—	4 6 2
Metropolitan	1	10	10	50/-	+⅛	4 0 0
Midland Counties	1	7	7	35/-	—	4 0 0
Mid. Elec. Power	1	8	8	38/9	+⅛	4 2 6
North Eastern Electric Ordinary	1	6	6	30/-	—	4 0 0
Do. 7% Pref.	1	7	7	33/-	—	4 4 10
Northampton	1	10	10	50/-	—	4 0 0
Notting Hill 6% Pref.	10	6	6	13½	—	4 10 7
North Met. Elec. 6% Pref.	1	6	6	30/6	—	3 18 8
St. James' and Pall Mall	1	8	8	32/6	—	4 6 2
Scottish Power	1	8	8	36/3	—	4 8 2
South London	1	8½	8½	33/-	—	4 4 10
Urban Ordinary	1	7	7	38/9	—	3 12 2
Westminster Ordinary	1	8½	8½	32/6	—	4 6 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 2
Yorkshire Elec.	1	8	8	42/6	—	3 15 3

HOME RAILS.

		1931	1932			
Central London Ord. Assented	Stock	4	4	84½	—	4 14 7
Metropolitan	„	2½	1½	71½	—	2 4 0
Do. District	„	4½	3	63½	—	4 14 6
Underground Electric	1	7	4½	19/6	—	4 12 4

TELEGRAPH AND TELEPHONES.

		1930	1931			
American Tel. & Tel.	$100	9	9	136½	+6	6 12 0
Anglo-Am. Tel. Pref.	Stock	6	6	102½	—	5 17 1
Do. Def.	„	1½	1½	24½	+½	6 2 5
Cables & Wireless 5½% Pref.	„	5½	2½	82½	+1	3 6 6
Do. A 7½% Ord.	„	—	Nil	28	+2	—
Do. B Ord.	„	—	Nil	10½	—½	—
Globe Tel. and T. Ord.	10	8½	Nil	11	—	—
Do. do. Pref.	10	6	6	11½	—	5 2 2
Great Northern Tel.	10	20	20	28½	+1½	7 0 0
Marconi-Marine	1	15	10	28/9	+6d.	5 4 4
Oriental Telephone Ord.	1	12	12	3	—	*4 0 0

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	—	—	1/9	—	—
Do. do. 2nd Pref.	5	—	—	1/9	—	—
Do. do. 5% Deb.	Stock	—	—	5	—	—
British Electric Traction Def. Ord.	„	5	5	255	—	—
Do. do. Pref. Ord.	„	8	8	135	—	5 18 8
Brazil Traction	100	—	—	9⅜	+⅜	—
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	15/-	—	—
London United Tram Deb.	Stock	4	4	73½	—	5 8 10
Mexico Trams, 5% Bonds	—	5	5	32½	—9	15 7 6
Mexican Light Common	100	Nil	Nil	7½	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	67	—	7 9 3
Victoria Falls Ord.	1	15	15	4¼	+⅛	3 10 6
Yorkshire (West Riding)	1	Nil	Nil	6/-	—	—

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	6	4	16/3	—⅛	4 18 5
Do. Pref.	1	8	8	30/-	—	5 6 8
Babcock & Wilcox	1	14	14	33/9	+⅛	—
British Aluminium Ord.	1	10	5	21/6	—	4 1 8
British Insulated Ord.	1	15	15	70/-	—	4 5 9
Brush Ord.	Stock	5	Nil	45	—	—
Callender's	1	15	15	2⅛	—	5 2 9
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/-	30	24	21/6	—	5 2 4
Do. 8% Pref.	1	8	8	32/6	—	4 18 6
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	11/3	—9d.	—
Enfield Cable Ord.	1	25	25	4½	—	5 11 1
English Electric	1	Nil	Nil	7/6	+⅛	—
Do. do. Pref.	1	Nil	Nil	11/3	+⅛	—
Ever Ready	5/-	35	35	28/9	+⅛	6 8 6
Ferranti Pref.	1	7	7	23/6	—	5 19 2
G.E.C. Pref.	1	6½	6½	29/9	—	4 7 5
Do. Otd.	1	10	8	2	—⅛	4 0 0
Henley's	1	30	30	6½	—	4 16 0
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	2/6	—	—
Johnson & Phillips	1	10	5	18/3	—	5 9 7
Siemens Ord.	1	7½	7½	26/3		5 14 3
Telegraph Construction	£1	Nil	Nil	18/9	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

16459. "Control arrangements for tubes with automatic discharge for switching purposes." Dubilier Condenser Co. (1925), Ltd. June 7th, 1930. (389459.)

17215. "Terminals of switches and other electrical units." J. A. Crabtree. June 13th, 1931. (389472.)

17906. "Luminous electric discharge tube." Rainbow Light Inc. June 26th, 1930. (389512.)

19604. "Welding." E. G. Budd Manufacturing Co. March 27th, 1931. (389460.)

19767. "Electric discharge tubes, particularly gas-filled luminous tubes." W. L. W. Schallreuter. April 11th, 1932. (389536.)

22946. "Remote control apparatus for electric current." D. A. Martin and J. Scott. August 14th, 1931. (389476.)

24685. "Electric glow discharge devices." British Thomson-Houston Co., Ltd. September 2nd, 1930. (389461.)

24883. "Vacuum electric switch." Siemens-Schuckertwerke Akt.-Ges. September 6th, 1930. (389463.)

24950. "Impregnation of dielectric materials." General Engineering Co. (Radcliffe), Ltd., and S. Taylor. September 5th, 1931. (389477.)

25097. "Locking devices for the ignition circuit of motor cars or the like." A. M. Donovan. September 7th, 1931. (Cognate application 35933/31.) (389478.)

25401. "Totalisators." Lightning Automatic Totalisator Co., Ltd., and L. V. Rothschild. September 10th, 1931. (389516.)

25445. "Dry rectifiers for alternating current." R. J. Elsome-Jones. September 10th, 1931. (Cognate application 32815/31.) (389470.)

26048. "Radio printing-telegraph systems." International Communications Laboratories Inc., and F. G. Hallden. September 17th, 1931. (389504.)

26049. "Superheterodyne radio receivers." Kolster Brandes, Ltd., and W. S. Persival. September 17th, 1931. (389505.)

26087. "Vacuum electric discharge tubes." N. R. Davis, C. R. Burch, J. H. Ludlow, and Associated Electrical Industries, Ltd. September 17th, 1931. (389509.)

26278. "Magneto-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. September 19th, 1931. (389533.)

28845. "Controlling means for electric lifts and other electrically driven apparatus." J. Bennie, Ltd., and J. Bennie. October 16th, 1931. (389548.)

31757. "Dividing boxes and other enclosures for electric connections." Callender's Cable and Construction Co., Ltd., and A. E. Wilson. November 16th, 1931. (389562.)

32997. "Magneto-electric ignition apparatus suitable for internal-combustion engines." R. Bosch Akt.-Ges. December 9th, 1930. (389570.)

33113. "Electric boilers." Widerstand Akt.-Ges. für Elektro-Wärme-Technik. January 26th, 1931. (389571.)

34068. "Electro-magnetic switches." E. L. Grangier and F. Niogret. December 8th, 1930. (389576.)

34303. "Electric relays." General Railway Signal Co. December 10th, 1930. (389580.)

34600. "Refractors for directing light." General Electric Co., Ltd., S. S. Beggs, and G. H. Wilson. December 14th, 1931. (389583.)

36070. "Lighting apparatus especially suitable for 'spot-lighting.'" D. H. Carlill. December 31st, 1931. (389597.)

1932

230. "Portable photo-electric photometers." General Electric Co., Ltd., E. G. Villiers, and G. T. Winch. January 4th, 1932. (389599.)

1861. "Telephone exchange systems." Ericsson Telephones, Ltd., C. W. Wilman, and C. C. Trapp. January 21st, 1932. (389613.)

2301. "Miner's electric safety and like battery lamps." T. A. Jones (trading as Patterson & Co.). January 26th, 1932. (389616.)

3103. "Automatic telephone systems." Siemens Bros. & Co., Ltd., and R. G. Dixon. February 2nd, 1932. (389623.)

3119. "Electric traction control gear." English Electric Co., Ltd., C. E. Fairburn, and F. Morris. February 2nd, 1932. (389624.)

3153. "Contact assemblies for electric relays." J. Gray and Associated Electrical Industries, Ltd. February 2nd, 1932. (389625.)

5838. "Synchronised induction motor specially adapted to television, telemechanics, the transmission of moving pictures, and like applications." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. February 28th. 1931. (389644.)

8090. "Electric water heaters." Electric Fires, Ltd., and C. H. Smith. March 18th, 1932. (389651.)

10022. "Isolating arrangements for enclosed electrical apparatus." International General Electric Co., Inc. April 8th, 1931. (389657.)

10566. "Fittings for use in electrical wall-boxes." J. A. Crabtree. June 13th, 1931. (Divided application on 17214/31.) (389491.)

10836. "Dial switches." Fuld & Co. Telephon-und Telegraphenwerke Akt.-Ges. October 22nd, 1931. (Addition to 383166.) (389661.)

11790. "Electric lamp-holders." H. Shulman. June 7th, 1932. (389664.)

12331. "Telephonic device for domestic and like purposes." N. C. Hypher. April 29th, 1932. (389670.)

12589. "Arc-rupturing devices for electric circuit interrupters." Westinghouse Electric Manufacturing Co. May 2nd, 1931. (389671.)

13439. "Joints for electric conductors." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 8th, 1931. (389673.)

16941. "Electric circuit breakers." British Thomson-Houston Co., Ltd. June 15th, 1931. (389691.)

17564. "Electric irons and other electric heating devices." C. A. Pharabet. July 6th, 1931. (389696.)

19702. "Arrangements embodying positive column luminous tubes for television purposes." Fernseh Akt.-Ges. July 30th, 1931. (389709.)

20223. "Electric switches." H. Trinkel and M. Hauser. July 16th, 1932. (389710.)

22421. "Transmission of electrical energy between alternating-current networks of different frequencies." Akt.-Ges. Brown, Boveri et Cie. August 10th, 1931. (389722.)

22440. "Mechanical translators for printing-telegraphs or the like." Siemens & Halske Akt.-Ges. August 27th, 1931. (Addition to 309129.) (389723.)

22635. "Electric discharge tubes for the emission of luminous rays." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 18th, 1931. (389726.)

22575. "Fire alarm street boxes or like signalling-apparatus." Standard Telephones and Cables, Ltd., and E. F. Bates. August 12th, 1932. (389725.)

22862. "Sound record for reproduction by magnetic or electrical means." H. Vogt. August 14th, 1931. (389728.)

23840. "Electric accumulators." Nederlandsche Electrolyt Maatschappij (Lighning Mij) Naamlooze Vennootschap. July 23rd, 1932. (389738.)

23843. "Electric hand lamps." Elektrotechnische Fabrik Schmidt & Co., Ges. November 3rd, 1931. (389739.)

26163. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 23rd, 1931. (389747.)

26485. "Brush-holders for dynamo-electric machines." British Thomson-Houston Co., Ltd. September 24th, 1931. (389749.)

26778. "Television systems." H. Jackson. September 27th, 1932. (389751.)

27093. "Electric torch batteries." G. Jäger. September 29th, 1932. (389754.)

28348. "Electric shaving apparatus." J. E. Pollak (Telephon-Apparat Fabrik E. Zwietusch & Co., Ges.). October 11th, 1932. (389760.)

28461. "Process for producing chemical reactions from gases and vapours with aid of a high tension electric arc." Soc. of Chemical Industry in Basle. October 16th, 1931. (389761.)

28775. "Detector and rectifier circuit arrangements and radio receivers incorporating the same." Marconi's Wireless Telegraph Co., Ltd. October 14th, 1931. (389763.)

30111. "Brush-holders for dynamo-electric machines." English Electric Co., Ltd., and E. H. H. Hassler. October 27th, 1932. (389766.)

30112. "Brush-holders for dynamo-electric machines." English Electric Co., Ltd., and J. C. Wilson. October 27th, 1932. (389767.)

30496. "Electric signalling cables." Felten & Guilleaume Carlswerk Akt.-Ges. November 25th, 1931. (389768.)

31813. "Electric audible signalling devices." British Thomson-Houston Co., Ltd. November 12th, 1931. (389772.)

33152. "Optical systems for sound reproducers." Radio Corporation of America. November 28th, 1931. (389776.)

34514. "Imitation solid fuel fires." Credenda Conduits Co., Ltd., and P. W. Davis. December 6th, 1932. (389779.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from April 5th:—

Mullard. No. 539051. Class 8. Thermionic valves and parts of radio-telegraphic and telephonic apparatus.—Mullard Wireless Service Co., Ltd., Spencer House, South Place, Finsbury, E.C.2.

Mazda-Vite. No. 537032. Class 11. Lamps for curative purposes.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

X-Ray Sound Films

IMPORTANT developments may be expected from researches reported by Heinz Grosse in *Elektrotechnische Zeitschrift*. By combining an X-ray cinematograph film with a sound record, a means is obtained of actually watching and listening to the action of the heart, lungs, and other organs of the body. Also, by studying the motion and effects of the vocal chords, much may be learnt concerning voice production and training. The first attempts to produce moving pictures by means of X-rays date back twenty-five years and more, and one of the main difficulties then experienced lay in the fact that negatives had to be taken full size. This difficulty has now been overcome by using special film to record, on a reduced scale, the radiations from a screen emitting infra-red rays instead of luminous fluorescence. These rays are amenable to refraction by lenses, whereas it has been ascertained that X-rays are not.

A more serious problem is that of recording the weak sounds concerned and, in particular, synchronising them with the pictures. The method of synchronisation explained in the author's German Patent No. 562,353 consists in starting the camera synchronously with the sound recorder before the X-ray exposure commences. The first picture is taken directly the X-rays are switched on and simultaneously there occurs a subsidiary frequency or background noise in the sound record. This does not interfere with the recording and subsequent reproduction of the sound film, but it affords an infallible means of synchronising the pictures and the sound. All that is necessary is to bring the commencement of the subsidiary sound record into line with the first picture and absolute synchronism is assured.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Amblecote (Worcestershire).—Houses (24), Vicarage Road; Webb & Gray, architects, Dudley.

Bath.—Bazaar premises for Marks & Spencer, Ltd.; Bovis, Ltd., builders, High Street, London, W.1.

Berkhamsted (Herts).—Houses (20); A. E. Brown, builder, The Broadway, West Ealing.

Bideford.—Hospital for the Joint Hospital Committee (£14,509); Building & Public Works Construction Co., Ltd., builders, Swindon.

Birkenhead.—Two blocks of houses, Tranmere Hall Estate; A. H. Boulton. Development of Walker Park Estate; Layton & Co.

Birmingham.—Offices near corner of Islington Row and Calthorpe Road, Edgbaston (electrical installation); J. Cotton, architect, 35, Waterloo Street. Shops at corner of Whitmore Road and Coventry Road, Small Heath; H. Holdsworth, builders, 200, Coventry Road, Hay Mills. Reconstruction of Hope Street School (£11,000) for E.C.

Blaydon-on-Tyne.—Houses (34), Winlaton Mill; N. Barker, builder, Rowlands Gill.

Bolton.—Houses (43), Gibbon Street (£14,906), clinic, Flash Street, and conversion of houses into flats; borough engineer. Houses (20), Salford Road; M. Welch. Houses (16), Plodder Lane; J. S. Hughes. Houses (11), Thorncliffe Road; F. & H. Douglas. Houses (10), Wheatfield Estate; W. Andrew. Town hall extension; A. J. Hope, architect. Twelve bungalows, Moorfield Estate (£2,719); Wm. Townson & Sons, Ltd. Out-patients' and massage blocks, Royal Infirmary, Chorley Street; governors.

Bournemouth.—Houses, Christchurch Road, Iford Housing Estate; S. Kermode, builders, Barrack Road, Christchurch.

Bridlington.—Bus station; A. Everingham, borough engineer, Town Hall.

Bristol.—Extensions, chapel, Broadmead; C. H. White, architect, 47, College Green.

Cheltenham (Gloucestershire).—New wards and extensions to nurses' home, Poor Law Institution, Swindon Road; county architect.

Chesterfield.—Police station extensions; borough architect. Transformer house, Sheffield Road; Lamp Caps, Ltd. Extensions, Poor Law Institution, Newbold Road; county architect.

Colchester.—Houses, various housing estates; borough engineer. Alterations, Myland Hall; Duncan, Clarke & Beckett, architects.

Croydon.—Houses (55), Ash Tree Way; Hall & Co., Ltd., 148, Addiscombe Road. Houses (60), Ockley Road; Wates (Streatham), Ltd. Factory extension, Purley Way; T. G. Crump. Motor coach station, Dingwall Road; H. Macintosh. Nursery school, Canterbury Road, and houses, Carlton Terrace; A. Law.

Cumberland.—Secondary school, Whitehaven; J. Forster, county architect, 4, Alfred Street North, Carlisle.

Dudley.—Two blocks of flats, Hill Crest Road; F. H. Gibbons, borough engineer.

Edinburgh.—Factory block, West Mills, Colinton; J. R. McKay, architect, 4, Melville Street. Garages, East Castle Road; T. P. Marwick & Son, architects, 54, Northumberland Street. Machine shop, &c., for J. Bertram & Son, Ltd.; Wm. Bruce, architect, 6, Rutland Square.

Enfield.—Houses (286), Aylands Estate; W. Goodchild & Co.

Ewell (Surrey).—Houses (127), Ewell Castle Estate; O. Diplock & Son.

Friern Barnet.—Four shops and flats, Great North Road; Montague Homes & Sons.

Glasgow.—Houses, Maryhill (54), Kelvindale Road (42), and West Craigton (34); housing director. Houses (180), Nether Auldhouse; Alexander M'Lellan & Co.

Gloucester.—Technical college laboratory (£2,450), for the United Schools Governors; clerk.

Gravesend.—Houses (10), Central Avenue; H. L. Smith.

Hanley.—Alterations, Eastwood Works, Lichfield Road; J. & G. Meakin, Ltd.

Hastings.—Houses, Barley Lane; F. H. W. Green. Houses, Old London Road; Ward, Son & Wray, architects. Factory, Landview Terrace; Farmer & Lovell. Alterations, Post Office; Jeffery & Bowcock, architects.

Hereford.—Flats (28), Bath Street, for Hereford Dwellings Co., Ltd.; H. E. Bettington, architect.

Hertfordshire. — Equipment of mental colony, Shenley (£50,000), for C.C.

Hoddesdon.—Box factory, Rye House, for Messrs. Hanibal.

Huddersfield.—New buildings for the Royal Hospital.

Hull.—Clearance scheme, Scott Street area; city engineer. Estate development, Providence Farm; W. H. Taylor & Co. Flats, New George Street area; Mr. Blanchard.

Ilford.—Houses (12), Freemantle Road; T. B. Goodwin, Ltd. Houses, Trelawny Road (153) and Newquay Terrace (16); C. F. Seigerts. Houses (59), Primrose Avenue; P. Triplete, Ltd. Houses (78), Royston Parade; J. Aldridge. Three shops and tea room, Eastern Avenue; H. Shaw.

Invergordon.—Council chambers and offices; burgh surveyor.

Ivinghoe (Bucks).—Motor racing track, with club house, lounge, restaurant, ballroom, &c., for a syndicate; W. H. Nockolds.

Keighley.—Houses (17), Colenso Drive; W. & H. Whitaker. Houses (15), Cromer Grove; J. Wharton. Houses (14), Manville Walk; A. Sharp.

Lanarkshire.—Houses, Auchenheath, Blackwood, and Rigside (electric lighting installations); P. C. Smith, county housing engineer, 13, Clydesdale Street, Hamilton. Reconstruction and extension, St. Margaret's R.C. schools, Airdrie; J. Stewart, county architect, 20, Albert Street, Motherwell.

Leeds.—Houses (180), Middleton Estate (£46,710); F. Clough. Cinema, Middleton Estate; Goldstones (Cinemas), Ltd. Factory, electrically equipped, Lupton Avenue; W. Jowett. Two shops, Scott Hall Road; Industrial Co-operative Society, Ltd.

Leicester.—Nurses' home for the Royal Hospital (£55,000).

London.—(Denmark Hill).—Extensions, Nurses' home (£15,000), and new floor (£20,000), for the King's College Hospital. (East Ham).—Reconstruction, Empire Cinema, Barking Road; W. E. Trent, architect. (North Woolwich).—Seamen's hostel, with electrical work and lifts, Victoria Dock Road, E. (£40,000); Rev. E. C. Stephens, senior chaplain, Mission to Seamen, Port of London. (Westminster).—Reconstruction of 18-29, Abingdon Street; Leaning & Sons, John Street, W.C.1. Reconstruction of Brook House, Park Lane; Wimperis, Simpson & Guthrie.

Manchester.—Clearance, Hulme area; two schools, Wythenshawe; and extensions, Chorlton Park, and St. Aloysius Schools; city architect.

Middlesbrough.—Premises for the Anglo-American Oil Co.; J. E. Jenkins, construction department, 36, Queen Anne's Gate, S.W.1.

Newcastle-on-Tyne.—Showrooms with six shops for R. J. Richardson, Ltd.; T. Clements & Son, builders, Selbourne Gardens. Additions to barracks for War Office; S. Bury, builder, 224, Westgate Road. Alterations to St. Mary's R.C. School; Mr. Mackin, builder, Felling-on-Tyne.

Newton-le-Willows. — Re-erection of Aysgarth Schools (£25,000); Joy & Archibald, principals.

Ossett (Yorks).—Reinstatement of textile mill after fire; J. W. Smith, Ltd., Healey Old Mill.

Otley.—Houses (24), Whiteley Croft Estate; U.D.C. surveyor. Alterations, stores, Kirkgate; Leeds Industrial Co-operative Society, Ltd.

Paisley.—Cinema and shops, Glasgow Road; W. J. Taylor, architects, Inverness.

Plymouth.—Police headquarters, police court and fire station, &c. (£40,000); J. Wibberley, borough surveyor, Municipal Offices.

Ponders End (Middlesex).—Extensions, Summerfield Chemical Works; T. Morson & Son, Ltd.

Rainham (Essex).—Joinery works, Ferry Lane, for G. S. Crabb.

Ravensthorpe.—Re-erection of corn mill, Low Lane, for E. Shaw (£20,000).

Rotherham.—Rehousing, Herringthorpe; borough engineer. Houses (23), Middle Lane; T. Gledhill. Business premises, Corporation Street; R. Marsh & Son. Church, Cambridge Road; vicar of Parish Church. Meat market, &c. (£10,500); borough surveyor. Three shops and offices, Moorgate Street; Crofts Estate, Ltd.

Runwell.—Mental institution for East Ham and Southend Corporations; Elcock & Sutcliffe, architects.

St. Helens (Lancs).—Pithead baths, Old Boston Colliery; J. H. Forshaw, architect. Miners' Welfare Committee, Dean Stanley Street, S.W.1.

Sheffield.—Houses (24), Addison Road; C. S. Smith. Houses (16), Forres Street; D. Topliss. Houses (14), Hutcliffe Wood Road; W. Bingham. Houses (16), Rivelin Valley Road; J. Barker. Building estate, Derbyshire Lane; City & Suburban Estates, Ltd.

Stalybridge.—Houses (20), Hanover Street; Norton & Cunningham.

Stockton-on-Tees.—Houses, Adelaide Grove; G. P. Stainsby, architect.

Stoke-on-Trent.—Workshops and garages, Kildare Street, Dresden (electric lighting installations); J. Grant & Son, builders, Commercial Street, Hanley.

Stretford.—Houses (24), King's Road; Littler & Rich. Houses Wenley Road; Smith & Alcock, Ltd. Police station, King Street; U.D.C. surveyor.

Sutton Coldfield.—Houses (500), Berwood Farm Estate, Penns Lane, Walmley, and conversion of Vesey House, High Street, into shops; Borough Surveyor's Office, Council House.

Swindon.—School, Pinehurst (£52,129); borough engineer.

Torquay.—Houses (12), Florida Road; P. D. Cananna. Development, Westwood Hall Estate; L. E. Currey. Municipal buildings (£25,000); Special Committee. Alterations to Bank, Strand; National Provincial Bank Ltd.

Tunbridge Wells.—Additional block, Cottage Hospital, Crowborough (£6,000); Ball, Langton & Dennis, architects, Broadway Chambers, Crowborough.

Uttoxeter.—Factory extensions, The Heath, for C. H. Elkes & Sons.

Wakefield.—Clearance, Providence Street area; city architect.

Wallsend.—Buildings, Willington Gut; R. Hood Haggie & Co., Akenside House, Newcastle.

Warrington.—New buildings for the Royal Hospital (£10,000).

West Sussex.—County offices (£79,650); county architect, Chichester.

Whitwell (Derbyshire).—Pithead baths (£19,000) for the Miners' Welfare Committee; J. Wheatley, secretary.

Wolverhampton.—Houses (12), Stafford Road; Bushbury Estate Co., Ltd. Houses (13), Willenhall Road (£3,324); A. M. Griffiths & Son, Ltd. Shop and houses (16), Jones's Avenue; T. Jones. Factory extension, Salop Street; John Shaw & Sons, Ltd. Additions, Queen Victoria Institution, Bath Road; governors. Extensions, stores, Stafford Street; Elephant Cabinet Co., Ltd.

Workington.—Houses, Princess Street; R. Ellis.

Worthing.—Flats (52), Ardsheal Road; J. A. Terry, Ltd. Houses (16), St. Andrews Road, &c.; H. M. Potter. Houses (14), Ethelwulf Road; R. G. Pierce. Houses (8), Victoria Road, and flats (48), George V. Avenue; M. R. Fletcher. Sports pavilion, Manor Grounds (£2,000); borough engineer. Alterations, Alexandra Hospital Home, Boundary Road; Mr. Clyde Young.

York.—Houses (130), Huntington Road Estate; F. W. Spurr, city engineer, Guildhall.